The Genesee-Finger Lakes Regional Fleet Electrification Study

GENESEE/FINGER LAKES
Regional Planning Council

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Executive Summary

The Genesee-Finger Lakes Regional Fleet Electrification Feasibility Study is a strategy for advancing fleet electrification in the nine-county region. This study provides information on the economic, operational, and environmental benefits of fleet electrification; identifies challenges and opportunities; and offers insights on how fleet managers can begin the electrification process. The goal of this study is to provide a "road map" for fleet managers and other regional stakeholders to follow when beginning the fleet electrification process. This study seeks to demystify the fleet electrification process by relating best practices, discussing why fleet managers are undertaking this process, explaining how technical and policy challenges were overcome, and identifying potential funding opportunities to offset the costs of fleet electrification.

The Fleet Electrification Feasibility Study is divided into five (5 sections):

1. Introduction to fleet electrification in the Genesee Finger Lakes Region
2. Economic and workforce development
3. Case studies
4. Recommendations
5. How-To Guides and Resources

The US Department of Energy characterizes all–electric vehicles (EV) as vehicles that have an electric motor instead of an internal combustion engine (ICE). The vehicle uses battery technology to power the electric motor and must be plugged in to a wall outlet or charging equipment, also called Electric Vehicle Supply Equipment (EVSE). Because it runs on electricity, the vehicle emits no exhaust from a tailpipe and does not contain the typical liquid fuel components, such as a fuel pump, fuel line, or fuel tank. Whether driven by state or federal mandates to reduce emissions, the need to balance budgets by lowering operating and fuel costs, a desire to reduce environmental impacts, or simply trying to get ahead of the transition to EVs, fleet managers are increasingly interested in electrifying their fleets. The decision of whether to electrify a fleet is dependent on an individual fleet's operational needs. Public transit, school bus, municipal, and organizational fleets can benefit from electrification through lower vehicle operating, maintenance, and lifecycle costs. When it comes to fleet electrification, local government agencies and companies have a unique opportunity to lead by example.

New York has made considerable progress in reducing greenhouse gas (GHG) emissions; since 1990 GHG emissions have fallen by 13%, and most of New York's GHG reductions have come from the electricity sector. While this progress is substantial, significantly more action is needed to reach an 85% reduction in GHG by 2050, and 70% renewable energy by 2030 as set by the Climate Act. This progress can be supported by the widespread use of electric vehicles. New York State has more electric vehicle registrations and public charging stations per capita than most states; and the nine county Genesee Finger Lakes Region has almost 6,500 registered EVs and over 200 public charging stations.

Section 2 provides an overview of state and region-wide progress that will support the momentum needed in growing the energy sector economy and outlines the current workforce and economic development conditions in the region.

Despite economy-wide job losses due to the COVID-19 pandemic, employment in New York State's alternative fuel sector climbed, seeing job growth by almost five percent largely driven by hybrid electric and electric vehicle sub-technologies. Alternative transportation supply chain industries have heavy concentrations of establishments and employment in the Genesee Finger Lakes Region, specifically in Monroe County and Erie County to the west. These industries are poised to grow during the next few years.

To grow the alternative fuel and EV sectors the following commitments were deemed necessary from regional workforce development partners:

- Work with businesses to ensure that their jobs are good jobs and can be long term careers.
- Connect prospective workers with opportunities to train for those good jobs.
  - Recruit in underserved communities
  - Recruit youth
- Provide necessary support to help prospective workers to succeed in training for and to retain and advance in those jobs.
- Regional partners will need to support businesses by helping them to overcome any barriers to equitable treatment of their workers, including any artificial barriers in the hiring and advancement of their workers.

The transportation sector is the largest contributor to GHG emissions in the U.S. disproportionately impacting low-to-moderate income (LMI) and minority communities. To meet the state's decarbonization goals, more work will need to be done to ensure equitable access to electric vehicles. Electric vehicles and infrastructure growth can be an opportunity to support the region's disadvantaged communities and stimulate the economy with EV related tourism.

Tourism is an important industry that drives economic development in the region. In 2019 tourism was a $3.3 billion industry, but due to the pandemic, visitor spending in the region plummeted 40% in 2020. This has caused much of the region to refocus and recraft critical messaging centered around the products and residents of their own communities and promoting the region to those who are within a five-hour driving market. Pulling from the five-hour driving market opens the region to expanding its electric vehicle infrastructure to attract additional guests to local communities and to downtown businesses. If people know that they can charge their vehicle in your community, they will stop to shop, eat, take in the natural scenery, and stay overnight in a local hotel. Charging station infrastructure will increase the exposure within community as guests, media, and prospective residents notice charging stations and the community's commitment to the goals of the Climate Act.

In Section 3 case studies from Fairport Electric, the City of Rochester, and Rochester Genesee Regional Transit Authority (RGRTA) are provided. These partners share their experiences as they have transitioned to electric vehicle fleet vehicles. They have indicated that they had positive experiences in adding electric vehicles to their fleets. Long term strategic planning is necessary to determine an effective strategy for fleet electrification and potential future build out. Fleet managers need a very clear understanding of how their current vehicles are used,

how far they travel, and under what conditions they must operate, before introducing electric vehicles. Long-term strategic planning for electric vehicles should include ways to engage with the community and publicize the benefits of fleet electrification. Publicizing the community benefits of electrification may encourage private citizens to become interested in EVs for their own use. Most importantly, the case study partners indicated that fleet managers looking to transition to electric vehicles must be patient and open minded. This new equipment will work differently and there may be different ways agencies can use this equipment to meet their needs.

Section 4 describes policy, design and implementation recommendations that should be taken at each level of government, (federal, state, and local) to support the switch to electric vehicles and make the 2020s the decade of transition to electric vehicles. Section 5 provides step by step guidance to turning your fleet electric and provides a list of valuable resources available.

Making the transition to electric vehicles will not only ensure New York can achieve the goals of the Climate Act but will also ensure that we reduce emissions, improve air quality, and see reduced operational costs. To see the full circle of benefits that electric vehicles and other alternative fuel sources can provide federal, state, and local policies will need to be updated and future proofed. Municipalities, developers, community planners, architects and engineers will all need to develop design standards that accommodate EVs and other alternative fuel transportation.

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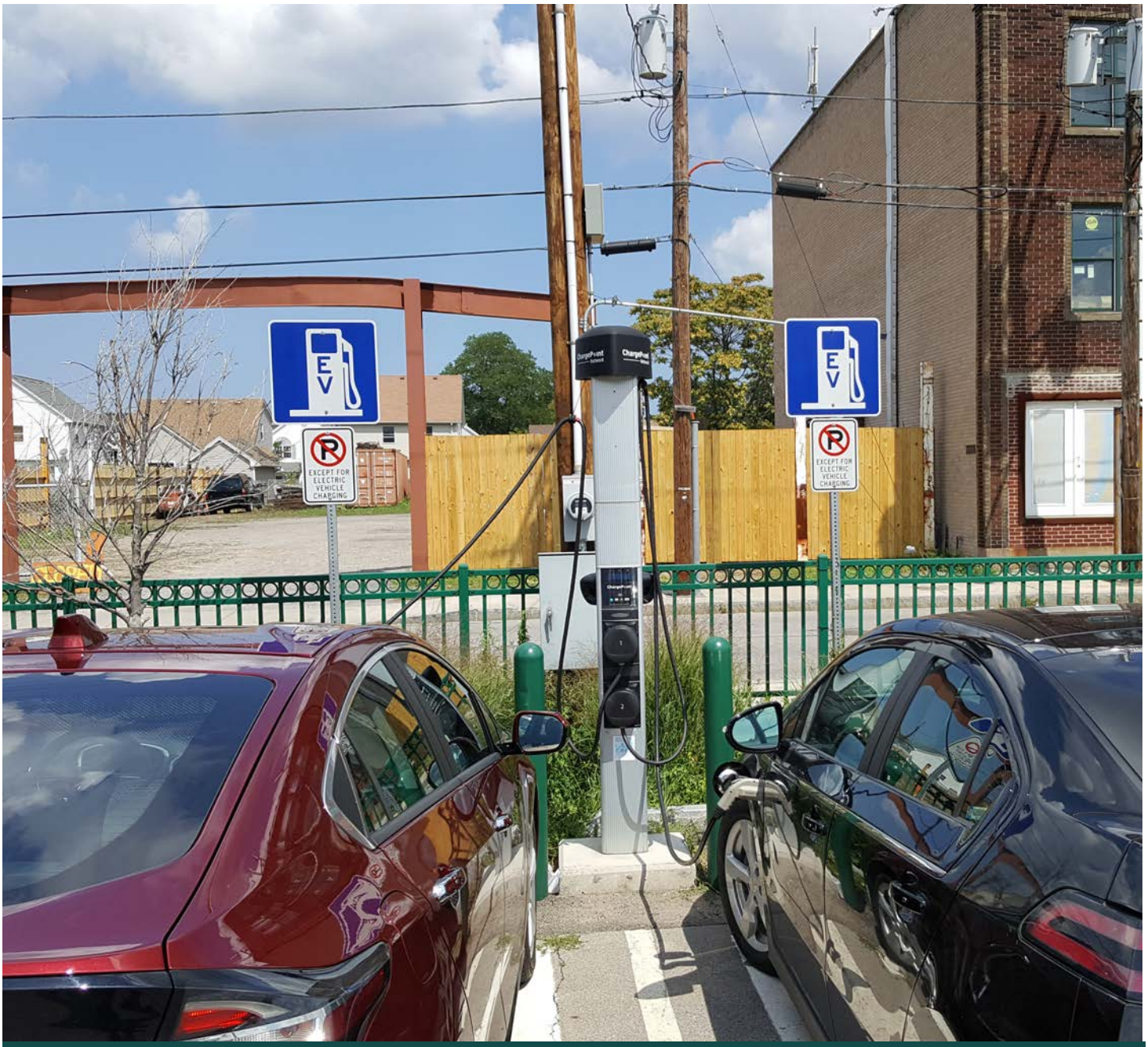

Section 1: Introduction to Fleet Electrification and the Genesee-Finger Lakes Region

1.Introduction to Fleet Electrification and the Genesee Finger Lakes Region

The Genesee-Finger Lakes Regional Fleet Electrification Study encompasses a strategy for advancing the conversion of vehicles by fleet owners that are currently operating using fossil fuels such as diesel and gasoline. The purpose of the study is to examine the economic, operational, and environmental benefits of fleet electrification. This study identifies challenges and opportunities for fleet electrification; and offers insights on how fleet managers can begin the electrification process.

Fleet electrification is the process of transitioning fleet fuel sources from fossil fuels to electricity. Key justifications for this transition include reduced emissions, improved air quality, and cost savings for vehicle operations and maintenance. Other benefits include positive public relations, the ability to leverage financial incentives including tax credits and rebates to acquire electric vehicles, compliance with current and anticipated government regulations of alternate fuels, and a decreased reliance on foreign fuel sources. Barriers to this transition include the high capital cost of purchasing electric vehicles and charging stations, the limited availability of public and private charging infrastructure, and a lack of practical electric vehicle options for all fleet operation needs.

The goal of this study is to provide a "road map" for fleet managers and other regional stakeholders to follow when beginning the fleet electrification process. This study seeks to illustrate the fleet electrification process by relating best practices, discussing why fleet managers are undertaking this process, explaining how technical and policy challenges were overcome, and identifying potential funding opportunities to offset the costs of fleet electrification.

This study recognizes that barriers exist to fleet electrification and acknowledges that the fleet electrification process may not be straightforward. To build confidence in fleet managers that they can implement the switch to alternative fuel sources in a cost-effective manner, this study discusses the findings from interviews with local fleet managers who are currently working on electrifying their fleets. It also discusses the findings from interviews with workforce development personnel who are focused on preparing the regional workforce for an electric future. By describing how the challenges to fleet electrification have been overcome, this study seeks to help fleet managers become more familiar with the fleet electrification process so they can work towards achieving New York State's greenhouse gas emissions (GHG) reduction goals.

The Climate Leadership and Community Protection Act

For New York's municipalities and public authorities, the key justification for the transition from fossil fuels to renewable energy is the 2019 Climate Leadership and Community Protection Act (CLCPA), or the Climate Act. The Climate Act set greenhouse gas reduction goals of 40% of 1990 levels by 2030 and 85% of 1990 levels by 2050.[1] The Climate Act is an important statewide backdrop to the electrification of transportation throughout the state. New York State has also set bold goals when it comes to electric vehicles. As of 2020, the state has committed to the following actions[2]:

- 10,000 charging stations installed by 2021;
- 850,000 EVs on the road by 2025;
- 25% zero emission (battery electric) by 2025 and 100% zero emission by 2035 for the following five transit agencies: Regional Transit Service (RTS), Capital District Transportation Authority (CDTA), Niagara Frontier Transportation Authority (NFTA), Suffolk County, and Westchester County;
- 100% electrification of the Metropolitan Transportation Authority (MTA) bus fleet by 2040; and
- A Memorandum of Understanding (MOU) adopting an action plan to transition to medium and heavy-duty electric vehicle purchases by 2050.

New York State's energy sector is going through an exciting time as new and emerging technologies are changing how the state generates, transmits, and uses electricity. Individuals, businesses, and governments are transitioning to renewable energy sources as those sources become more available and affordable. To achieve these goals, New York will need to connect the workforce with renewable energy career pathways as addressed in Section 2. All New Yorkers will need access to funding and incentive opportunities addressed in Section 5 and at both the state and municipal levels will need to see changes to zoning and building codes to ensure we have the infrastructure needed for this transition as addressed in Section 4.

What is Fleet Electrification?

The U.S. Department of Energy characterizes all–electric vehicles (EV) as vehicles that have an electric motor instead of an internal combustion engine (ICE). The vehicle uses a large traction battery pack to power the electric motor and must be plugged in to a wall outlet or charging equipment, also called Electric Vehicle Supply Equipment (EVSE). Because it runs on electricity, the vehicle emits no exhaust from a tailpipe and does not contain the typical liquid fuel components, such as a fuel pump, fuel line, or fuel tank. Because it runs on electricity, the vehicle emits no exhaust from a tailpipe and does not contain the typical liquid fuel components, such as a fuel pump, fuel line, or fuel tank.[3]

Making the transition to electric vehicles will not only ensure New York can meet the climate goals stated

Figure 1.1: City of Rochester electric fleet vehicles

in the Climate Act, but will also ensure that public fleets reduce emissions, improve air quality, and see cost savings. Other benefits of vehicle electrification include positive public relations, the ability to leverage financial incentives including tax credits and rebates to acquire EVs and EVSE, compliance with any anticipated government regulations about alternate fuels, and a decreased reliance on foreign fuel sources.

The fleet electrification process includes phasing in EVs into the fleet vehicles owned or leased by a business, government agency, or other organization while phasing out traditional ICE vehicles. This process requires fleet managers to consider their operational goals and needs, fleet management structure and organization, and the policies in place to successfully convert to an electric fleet. Important questions to be answered include:

- What are the reasons your municipality or organization is switching to EVs?
- Is switching to EVs going to be operationally and financially viable?
- Do all fleet vehicles need to be fully electric? If not, which vehicles in the fleet are the right candidates for switching?
- What new maintenance and vehicle cycle mechanisms need added to fleet operations?

These questions and other considerations are discussed more thoroughly in Section 5.

Why Should Fleets Electrify?

Whether driven by state or federal mandates to reduce emissions, the need to balance budgets by lowering operating and fuel costs, a desire to reduce environmental impacts, or simply trying to get ahead of the transition to EVs, fleet managers are increasingly interested in electrifying their fleets.

The decision of whether to electrify a fleet is largely dependent on an individual fleet's operational needs. Public transit, school bus, municipal, and organizational fleets can benefit from electrification through lower vehicle operating, maintenance, and life-cycle costs. Switching to cleaner fuel sources will also improve air quality in areas where people congregate (bus stops, schools, and transit hubs) and can reduce vehicle noise. When it comes to fleet electrification, local government agencies and companies have a unique opportunity to lead by example. By adding electric vehicles to their fleets, municipalities and businesses have a highly visible way to promote their environmental sustainability initiatives and contributions to the communities they serve.

The future of EVs is very bright, especially with the recent announcement by auto manufacturers that have committed to ending their production of gas-powered cars and trucks as soon as 2035.[4] Auto makers are accelerating their EV launch plans partially to comply with stringent regulations being set by countries around the globe. According to BloombergNEF's Electric Vehicle Outlook 2020, by 2022 there will be over 500 different EV models available globally. These options will increase consumer choice and reduce the cost of EV ownership.[5] The arrival of cheaper electric vehicles from a variety of brands will bring a more complete range of models and prices. This will act as a real catalyst for market development and help accelerate the sales of EVs around the globe. By 2040 it is predicted that over half of all vehicles sold will be electric.[6]

As technology advances and EV models are becoming more widely available and more affordable, fleet managers are continuing to uncover the potential benefits of fleet electrification. Other than an increase in vehicle availability, there are several factors that are currently driving the EV market: battery technology, vehicle cost savings, and environmental sustainability. Each of these factors are described in detail below.

Battery Technology

Lithium-ion batteries are the biggest cost for an EV and is a critical part necessary for widespread adoption. Battery pack prices fell 87% from 2010 to 2019, with the volume-weighted average hitting $156 per kilowatt hour. Underlying material prices will play a larger role in the future, but the introduction of new chemistries, new manufacturing techniques and simplified pack designs will keep prices falling, decreasing the cost of vehicles.[7]

Many consumers fear that they are currently limited in their driving range-per-charge and charging time. If directly compared to conventional vehicles on the market, EVs are believed to be less convenient for long-distance travel. Many have range anxiety, which is defined as the anxiety an EV driver feels when the battery charge is low, and the usual sources of electricity are unavailable. It sparks a fear of getting stranded somewhere, which adds time, inconvenience, and stress to a journey.[8] While range anxiety is real, it is no greater of a concern than the miles per gallon concern in a conventional ICE vehicle. The average person only drives 31 miles per day, which is well within the range of even the smallest EV battery half charged.[9] Lithium-ion batteries also keep improving. In 2014, the Nissan Leaf had a battery range of 84 miles. Today, the 2021 Leaf can travel up 226 miles on a single charge.[10] From a Direct Current Fast Charging (DCFC) station a vehicle can obtain an 80% charge in 45 minutes. As battery technology continues to improve, drivers could soon be able to travel 100 miles on a five-minute charge, and have practically no problems with charge degradation or range anxiety.

EVs are often more digitally connected than conventional vehicles, with many EV charging stations providing the option to control charging from a smartphone app. Just like a smartphone, you can plug in your EV when you get home and have it ready for you to use the next morning. Since the electric grid is available almost anywhere you can charge your vehicle at home, work, or even on the road.

Vehicle Cost

Today, the price of electric vehicles is still generally higher than that of traditional vehicles. However, prices for alternative fuel vehicles are getting ever closer to parity with traditional fueled vehicles. There is growing evidence that in terms of total costs, running an electric vehicle is less expensive. This is partly due to the price differential between electric and traditional vehicle fuels is not as large as it used to be, and over the life of the electric vehicles the maintenance costs are less.[11]

By 2023, it is anticipated that the average price for lithium-ion batteries will be $100 kilowatt per hour. This is around the price point that automaker should be able to make and sell mass market EVs at the same price (and with the same margins) as comparable ICE.[12] As battery costs decrease and there are more EV options available for consumers vehicles will be cheaper and more abundantly used for all travel options.

Cost Savings

Transitioning to electric vehicles will bring significant economic benefits to households, businesses, and governments. The lowest income households spend 11.2% of their annual income on fuel, maintenance, and repairs compared to all other households that spend 4.5% of their annual income on these expenses.[13] Phasing out ICE vehicles in low-income and disadvantaged communities and communities of color will reduce local air pollution, and the lower maintenance and fuel costs could alleviate strain on household budgets.

Electric vehicles are simply more efficient than their gas-guzzling counterparts, costing 50 to 70% less to operate.[14] According to the 2021 American Automobile Association's (AAA) Your Driving Cost Report the average small sedan costs 15.67 cents per mile in fuel and maintenance costs, while the average EV costs 11.36 cents per mile.[15] EVs have fewer moving parts than those powered by internal combustion engines; EV motors have about 20 moving parts, while internal combustion engines have about 2,000. EVs need fewer tune-ups and do not require belts, oil filters and oil changes. EVs also use regenerative braking, which reduces wear on tires meaning a reduction in maintenance costs.

While New York and much of New England have some of the highest average electricity costs, charging an EV is still more cost effective than filling up at the gas pump. In 2017 the Union of Concerned Scientists conducted a study on the cost savings of EVs. Of the 58 cities observed in 37 different states the median EV driver could save more than $770 per year on annual fuel costs compared to a gasoline powered vehicle. This study looked at New York City and the average ConEdison utility user would save over $1,000 per year on fuel savings if they switched to an EV.[16]

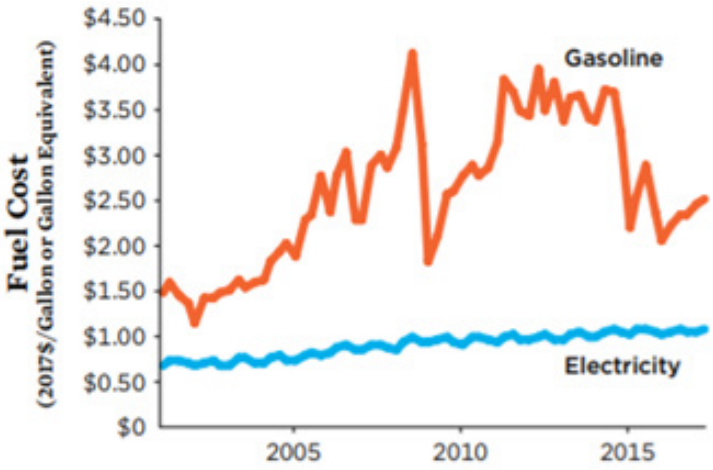

Figure 1.2: Price Volatility, Electricity Vs. Gasoline

While the price of electricity can vary among providers, the average is much less volatile than that of gasoline. Electricity prices tend to rise demand, but year-to –year variations are low. Regional and national gas prices on the other hand vary greatly and unpredictably. Prices can change due to refinery accidents, natural disasters, global policies, or military actions.[17] EV drivers benefit from lower and more predictable fuel costs, while gasoline-powered vehicles expose car buyers to potentially large increases.

Environmental Sustainability

Policymakers are pushing communities and auto makers towards lower emission standards. Fuel economy regulations, quota systems, and municipal policies all play a growing role in reducing GHG emissions and starting the phasing out of traditional gas-powered vehicles. Currently, 13 countries and 31 cities have announced plans to phase out ICE vehicles; including New York State[18]. In addition, sustainability commitments from major brands, including delivery giants Amazon, UPS and FedEx have all announced plans to electrify in the coming years. In 2019, Amazon announced its intention to purchase 100,000 electric delivery vans from Rivian, with plans to deploy the first 10,000 as early as 2022.[19]

Locally, NYSEG and RG&E's parent company AVANGRID was the first utility in the nation to announce its pledge to achieve generation-related carbon neutrality by 2035 and plans to further electrify its fleet to reduce emissions. In March 2021 the company added a new electric backhoe to their fleet, adding to the electric mini excavators, bucket trucks, and cars already in service. The company's goal is to convert 60% of its fleet to clean energy vehicles by 2030, supporting New York state's ambitious energy and decarbonization goals.[20]

Electric vehicles produce substantially less emissions that contribute to climate change and smog than conventional ICE vehicles. Direct emissions are emitted through the tailpipe, through evaporation from the fuel system, and during the fueling process. Direct emissions include nitrogen oxides, other pollutants harmful to human health, and greenhouse gases. All-electric vehicles produce zero direct emissions, while plug-in hybrid electric vehicles produce fewer emissions than conventional vehicles.[21]

Life cycle emissions are all emissions related to fuel and vehicle production, processing, distribution, use, and recycling/disposal. All vehicles produce substantial life cycle emissions and calculating them is complex. However, EVs typically produce fewer life cycle emissions than conventional vehicles because most emissions are lower for electricity generation than burning gasoline or diesel.[22]

Electric cars give us cleaner streets, making our cities, towns, and villages better places for all users of the road, including bicyclists and pedestrians. The reduction of GHG emissions will make our region more desirable for families and businesses. In over a year, just one electric car on the roads can save an average 1.5 million grams of CO2; the equivalent of four return flights from Rochester to Atlanta.[23]

Over the last ten years the U.S. has used on average 7.1 billion barrels of oil, two thirds of which has gone to transportation. Our reliance on petroleum makes us vulnerable to price increases and supply disruptions. EVs help reduce this threat because almost all U.S. electricity is produced from domestic sources, including coal, nuclear, natural gas, and renewable sources. Electric vehicles can also help the United States have a greater diversity of fuel choices available for transportation.[24]

At this stage, as more EV options become available, certain automobile manufacturers begin to phase out ICE vehicles, and fuel prices and taxes increase, buying a conventional gas-powered vehicle may not make sense for fleet managers or individuals.

New York's Energy Profile

In New York State, sources of power largely depend on whether you are in upstate or downstate. The electricity coming out of your wall can originate from sources as varied in geography as they are in types of resources. The mix of energy resources in upstate New York is vastly different than the mix of supply resources downstate. The upstate energy zone including the Genesee-Finger Lakes Region is home to most of the hydro-power generation in the state and is attracting growing investment in large wind generation projects. In the Upstate zones 88% of energy generation is zero-emission; 41% nuclear, 40% hydro power, and 7% wind power[25]. Conversely, New York City, Long Island and Westchester is the largest load center for power consumption, and home to the majority of fossil fuel burning generation in the state. Only 29% of energy generated in that region is zero emission as shown in Figure 1.3 below.[26]

New York's transmission system can become constrained in its ability to deliver energy from clean energy resources from upstate New York to the large consumer demand areas downstate. Thus, we have what we call the "tale of two grids." To meet the mandates of the Climate Act, the transmission system will need to be expanded to facilitate greater flows of electricity from clean energy resources upstate to downstate consumers.[27]

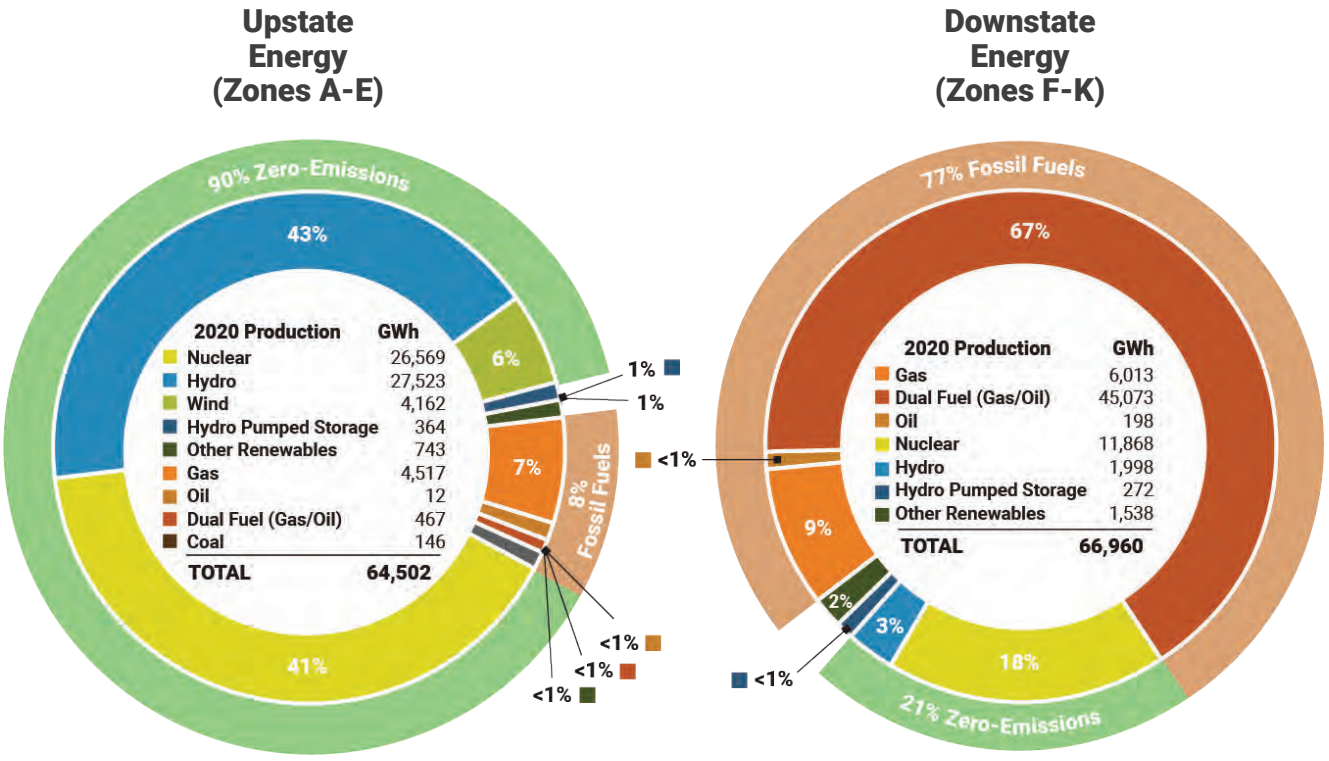

Figure 1.3: Energy Production by Fuel Source in Upstate and Downstate, New York, 2020

The transportation and on-site combustion from residential use are the largest emitters of GHG emissions in New York State as shown in Figure 1.4. Transportation is responsible for 36% of GHG emissions and residential use is 15%. On-site combustion from residential, commercial, and industrial energy use, together contributes 30% of all GHG emissions in the state. Non-energy emissions from waste, agriculture, and industrial processes and product use for 15% of all GHG emissions and the electricity sector also produces 15% of statewide emissions.[28]

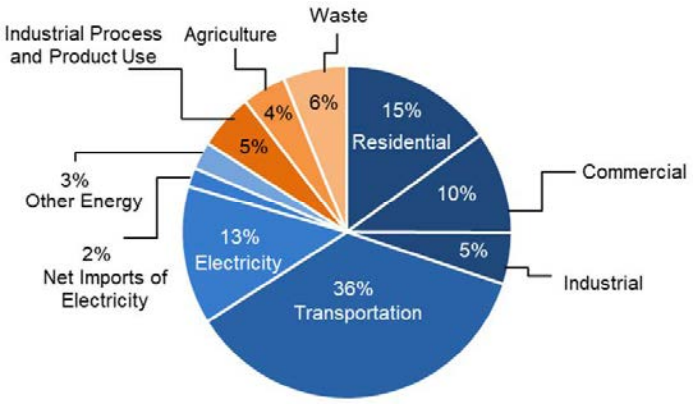

Figure 1.4: 2061 New York State GHG Emissions by Sector

New York has made significant progress in reducing GHG emissions as shown in Figure 1.5.[29] Since 1990, GHG emissions have fallen by 13%, and most of New York's GHG reductions have come from the electricity sector, which have decreased by more than 50%. While this progress is large, significantly more action is needed to reach an 85% reduction in GHG by 2050, 100% zero-emission electric by 2040, and a 70% renewable energy by 2030 as set by the Climate Act.[30]

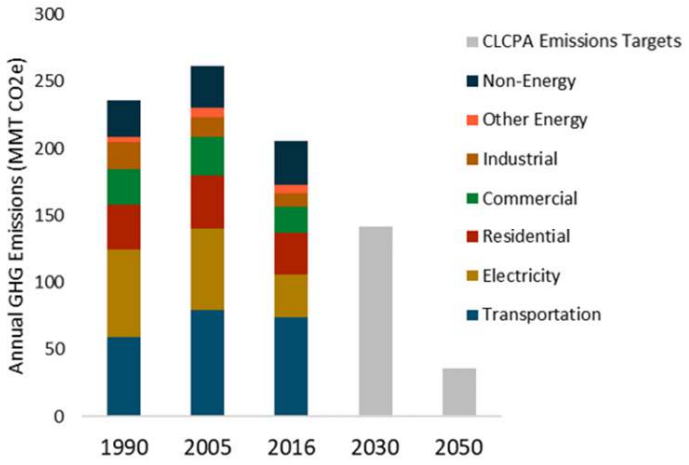

Figure 1.5: NYS GHG Emissions by Sector: 1990, 2005, 2016, & CLCPA Targets

Power Generation by Source

Nuclear Power

Overall, 41% of the update zone's power is generated by nuclear power coming from the states three active nuclear plants; JA Fitzpatrick, R.E. Ginna, and Nine Mile Point; all located along Lake Ontario. These three plants account for 29% of New York's utility-scale net generation in 2020 and generate approximately 2,600 megawatts of electric power.[31]

In 2020 Indian Point retired its second nuclear reactor, and in April 2021 the third and final reactor was retired after several years of phasing out operations. Indian Point Units two and three had a total capacity of approximately 2,144 megawatts, representing 40% of the state's nuclear capacity and 13% of the state's power generation, serving over 2 million homes.[32] The permanent closure of Indian Point has removed a

significant amount of carbon-free generated power from New York's energy profile creating problematic outcomes for reaching the state's energy goals. 3,200 megawatts of nuclear capacity will need to be generated at the three remaining plants in the state or electricity generated by Indian Point will be replaced by carbon producing fossil fuel sources.[33]

The R.E. Ginna Nuclear Power Plant is one of the state's three remaining nuclear power plants, located in the Town of Ontario, in Wayne County on the shores of Lake Ontario. The plant's single reactor produces 576 megawatts of energy that supplies power to approximately 500,000 homes and businesses around the Rochester area. Opened in 1970, Ginna is the oldest nuclear power plant in the country and the license is currently set to expire in 2029. If the license were to expire it would result in more of New York State's energy being generated from fossil fuels, unless we the state continues to utilize other green energy sources.[34]

Figure 1.6: Nuclear Power Plants in NYS

Hydroelectric Power

New York is consistently among the nation's top four producers of hydroelectricity; in 2020 the state produced more hydroelectric power than all but two other states, Washington and Oregon. Almost half (40%) of the upstate region's electricity is generated by hydroelectric power much of which is produced by the Robert Moses Niagara hydroelectric power plant in Lewiston near Niagara Falls.[35] The Robert Moses plant uses 13 generators at an installed capacity of 2.5-gigawatts, producing the largest share of New York's hydropower. The electricity produced at this plant generates power for 1.92 million homes. There are five total power stations on the Niagara River including the Robert Moses Power Plant, two on the United States side and three on the Canadian side. In total the U.S. side has capacity of 2.7 million Kilowatts.[36]

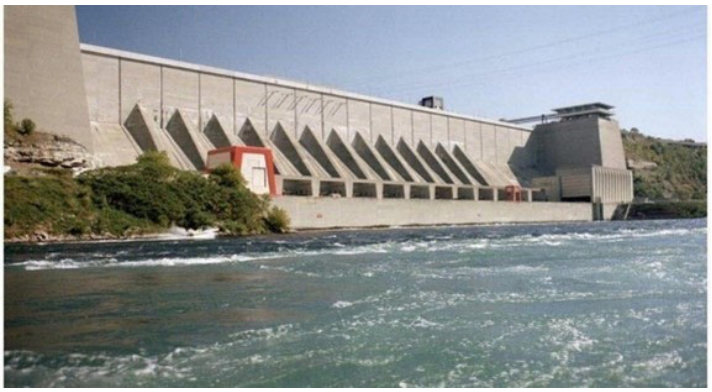

Figure 1.7: Robert Moses Niagara hydroelectric plant

Wind Power

Wind power accounts for 7% of the update New York's energy and the Great Lakes and the Atlantic shoreline is poised to become a major source of affordable, renewable power for New York. As of June 2021, New York had a total of about 2,000 megawatts of wind capacity at almost two dozen wind farms. The State is looking to develop an additional 9,000 megawatts of offshore wind energy by 2035, enough to power up to 6 million homes[37]. The DOE estimates that the wind energy off New York's coastline alone could generate 40,000 megawatts of clean electricity, which is enough to power more than 11 million homes[38].

Solar Power

Solar energy accounted for only 2.5 % of electricity generation in New York in 2020, however it is an important and growing industry across the state, particularly in the Genesee-Finger Lakes region.[39] In 2020, the state ranked fifth in the nation in electricity generation from small-scale solar. The State encourages small-scale rooftop and ground-mounted solar installations through a variety of financial support and incentive programs. The Genesee Finger Lakes region saw the second-highest growth in solar installations across the state between 2011 and 2016. There were 1,870 solar projects installed in the Finger Lakes region in that period, an increase of 600%. Solar power for all regions across the state has increased an average of 800 %, leading to $1.5 billion in private investment and helping New York reach his clean energy target that 50% of the state's electricity come from renewable sources by 2030.[40]

There are 21 large-scale solar, wind, and energy storage projects set to be built across upstate New York, totaling 1,278 megawatts of new renewable capacity, enough to power over 350,000 homes. In our region a 20-megawatt solar facility will be constructed Castille (Wyoming County). The project is expected to receive over $2.5 billion in direct, private investment, and create over 2,000 short and long-term jobs.[41]

As New York State increases its electric generation footprint using zero-emission technologies it opens new opportunities for high wage jobs and manufacturing opportunities to New Yorkers across the state and in our region.

The Current State of Electrification in the Genesee Finger Lakes Region

Our communities and state are starting to address the need for electric vehicles and infrastructure across a broad spectrum of efforts. New York State has more electric vehicle registrations and public charging stations per capita than most states the nine county Genesee Finger Lakes Region has almost 6,500 registered EVs and 244 public charging stations.[42] This work can build on the already-established momentum as the region continues to make this shift. Our existing clean energy infrastructure gives us a smaller gap to close. To make progress everyone in our community understands the need for this work and their role in the transition.

Vehicle Registration

In January 2021 there are over 9.5 million cars and light-duty trucks registered in New York State and approximately 91,000 of those are electric vehicles.[43] While most of the cars registered in New York and across the country are convention gasoline powered vehicles, the rise in EV registrations indicates that demand for electric vehicles has increased.

Between 2011 and January 2022, the number of electric vehicles; battery electric (BEV) and plug in hybrid electric (PHEV) on the road increased dramatically in the state and in the Genesee Finger Lakes Region as shown in Figure 1.8. Based on EvaluateNY data, our region saw an increase from just two EVs on the road in all nine of our counties to almost 6,500.[44] Over the ten-year period Monroe County saw the biggest increase in the region; but each of the Genesee Finger Lakes counties saw a significant increase. See Appendix F for increase of registered EVs by County over the last ten years.

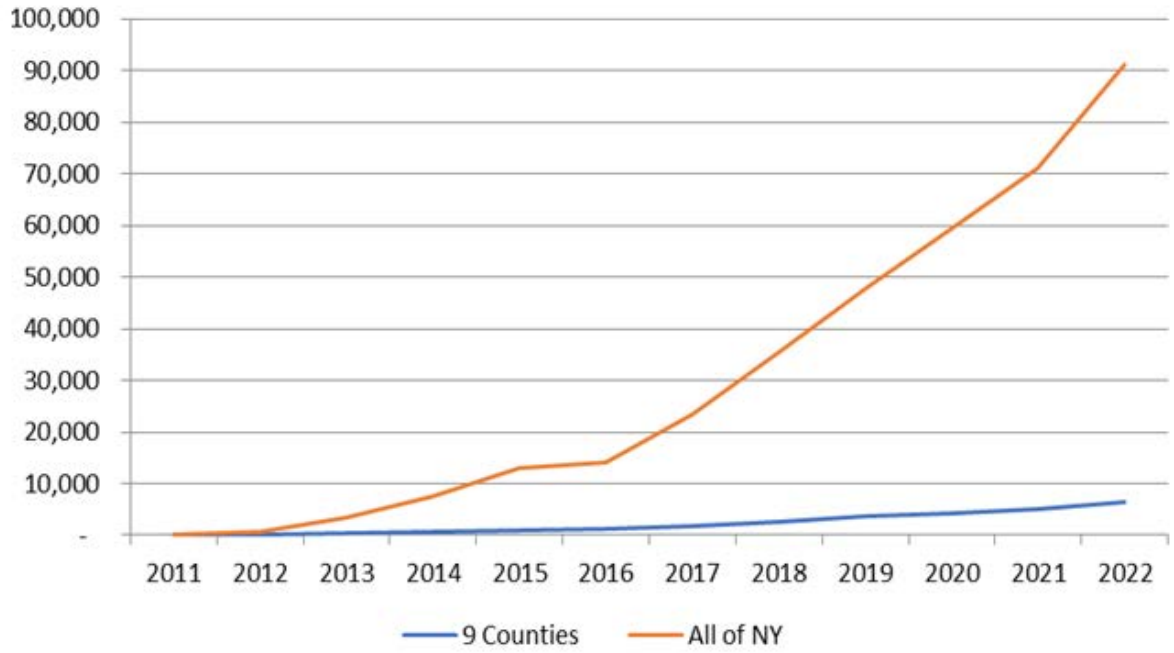

Figure 1.8: Registered Electric Vehicles in New York State and the G-FL Region 2011-2022

Fleets

Within the Genesee-Finger Lakes region, several fleets are taking initial steps towards electrification; and many more municipalities, organizations and school districts are investigating the costs and benefits of including electric vehicles into their fleets in the future.

Notably the following organizations and municipalities in our region currently have electric vehicles in their fleets:

- Village of Fairport and Fairport Electric
- Town of Canandaigua
- City of Canandaigua
- Village of Perry
- City of Rochester
- Regional Transit Service (RTS)
- Monroe County
- RG&E/Avangrid
- Monroe Community College
- University of Rochester
- United Parcel Service (UPS)

Infrastructure

Consumers and fleet managers who are considering adding electric vehicles to their fleets will need to be able to access critical infrastructure to make a seamless transition from ICE to electric vehicles. Infrastructure such as changing stations, a capable electric grid, as well as battery storage and recycling systems are key components to vehicle electrification.

Charging Stations

As of January 2022, there are 244 publicly available charging stations in the nine county Genesee-Finger region. Figure 1.9 shows the locations of all the public and private Level 2 and DCFC stations available in the region. For a dynamic tool to find charging stations in our region, utilize the Alternative Fuels Data Center (AFDC): https://afdc.energy.gov/fuels/electricity_locations.html#/find/nearest?fuel=ELEC

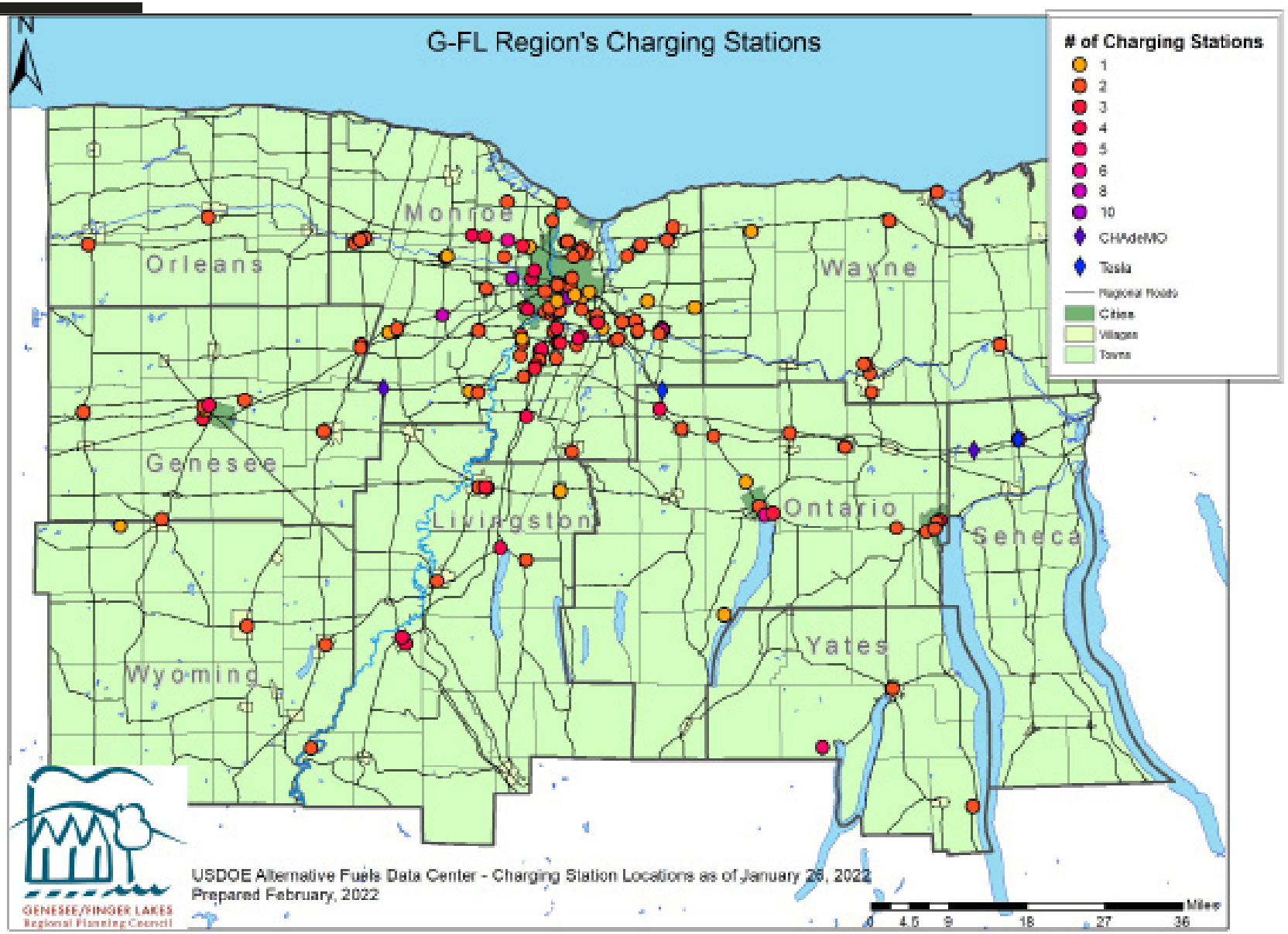

Figure 1.9: G-FL Region's Charging Stations

Approximately 70% of charging stations are in Monroe County. The Town of Penfield installed the first public EV charging station in Monroe County in 2012 at the Penfield Community Center. Since then, the Town has installed several more charging stations.[45]

Across the region charging stations are found at community centers, libraries, shopping center parking lots, apartment and office complexes, and at on street parking spaces. When the New York State Thruway rest stops are renovated there will be EV charging stations available at all rest stops supporting the goals of the Climate Act.[46] Convenient charging stations are important to the mass adoption of electric vehicles. Programs like the EVolve NY and utility programs will support the Climate Act goals by supporting the continued adoption of electric vehicles and increase the installation of public charging stations in convenient locations across the state and the region.

In January 2020, New York state set up a statewide utility-supported Make-Ready program to promote EV charging station deployment. This program has directed the State's utilities to build the grid infrastructure needed to enable the installation of publicly accessible chargers, encouraging more New Yorkers to choose electric vehicles while creating jobs and ensuring our energy dollars stay in-state.[47] The New York Power Authority's (NYPA) EVolve NY program has set aside $250 million to install up to 800 new DCFC charging stations across the state by 2025 along major highway corridors. The goal is to make EV adoption easy and convenient.[48]

As part of the EVolve program, the Village of Fairport was the first EV model community. In February 2021 Fairport installed their DCFC stations and 28 Level 2 charging stations as part of the statewide program.[49]

Figure 1.10: Town of Penfield Charging Station

Figure 1.11: Village of Fairport Charging Stations

Electric Grid

A model utility with two to three million customers would need to invest between $1,700 and $5,800 in grid upgrades per EV through 2030, to support widespread fleet electrification according to Boston Consulting Group. Assuming 40 million EVs are on the road, that investment could reach $200 billion.[50] It is estimated that by 2050 the electrification of the transportation and other sectors will require doubling the U.S. electricity generation capacity.

While New York State has one of the cleanest electric grids in the country, our electric power capacity will need to grow to meet the demand of all electric vehicles and building systems. Electricity transmission constraints on today's system will need to be addressed to meet the goals of the Climate Act. More will need to be done to deliver emissions-free electricity that is abundant in northern and western New York, such as production from hydro, nuclear, and wind generation resources, to downstate where most of the state's electricity is consumed[51]. The state is planning developments of offshore wind resources off the coast of Long Island and in the Great Lakes as well as prioritizing the construction of New York's "Green Energy Transmission Superhighway" to bring clean energy generated upstate, to high-demand areas. The superhighway plan will construct 250 miles of transmission in 2021 alone.[52]

In 2020 the annual energy usage was 2.6 % below expected forecasts, with the largest impacts seen in April and May with usage across New York state more than 8% below expected levels. The most significant driver behind the reduction in energy consumption was reduced demand from commercial customers due to the COVID-19 pandemic. While overall usage and demand levels have fallen; demand patterns have changed, seeing an increase in residential usage, especially mid-day.[53]

Figure 1.12 below represents three energy forecasts through 2051 developed by the New York Independent System Operator (NYISO). The baseline scenario reflects the expected influence of energy efficiency and behind-the-meter resources, as well as the expected rate of near-term economic recovery and long-term economic growth[54]. Behind-the-meter (BTM) refers to anything that happens on the energy users' side of the meter that controls energy costs and reduces carbon footprint. BTM systems are anything that can be used on the consumers end to reduce the amount of power that needs to be pulled from the grid.[55]

The high-load scenario evaluated conditions with higher adoption rates for electrification and reduced adoption of energy efficiency measures and BTM solar.[56]

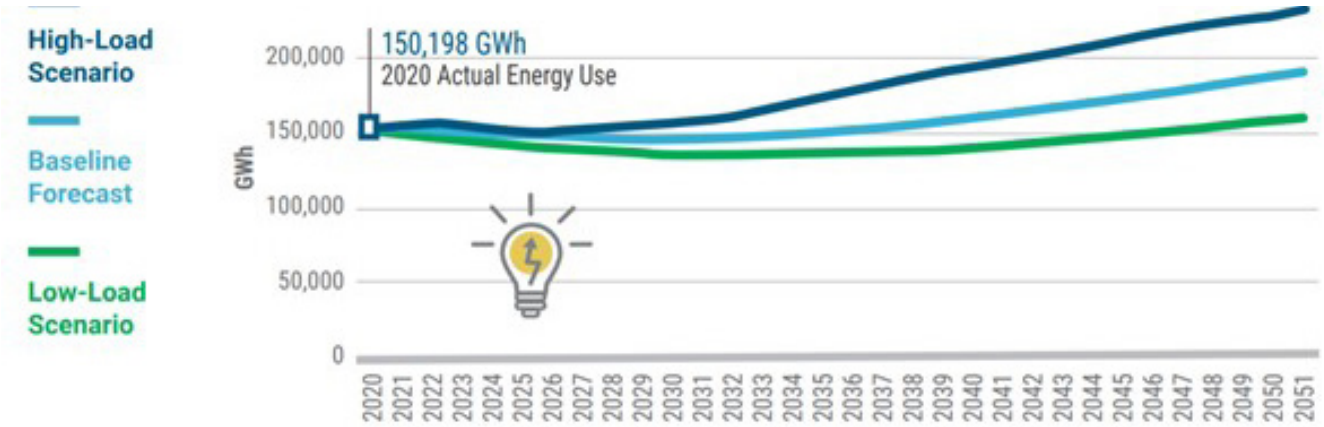

Figure 1.12: Electric Energy Usage - Actual & Forecast: 2020-2051 (GWh)

Battery Recycling & Storage

The Climate Act codified the State's clean energy and energy storage goals, including deploying three gigawatts of energy storage on the State's electric grid by 2030 and achieving significant reductions in carbon emissions in the transportation sector. This legislation reinforces that New York State is leading the way to growing significant markets for energy storage.

The Genesee Finger Lakes region is strong leader in the research, development, testing and commercialization for energy storage. The region has several universities, organizations, and companies who are all part of the New York Battery and Energy Storage Technology Consortium (NY-BEST) to promote energy storage and lead the development and deployment of energy storage solutions. Within our region we have testing and prototyping centers, and large companies who are providing advanced solutions in battery development, storage, and recycling.

Figure 1.13

The BEST Test and Commercialization Center (BTCC) was opened in April 2014 located at Eastman Business Park in Rochester. The center supplies testing, validation and independent certification capabilities that are necessary to introduce new energy storage technologies into the marketplace. BTCC includes testing equipment for battery testing of secondary cells and battery packs, as well as temperature test chambers and modular walk-in temperature test chambers. Since its opening, the BTCC has helped dozens of companies to evaluate and confirm the performance of their products.[57] In March 2015, the Battery Prototyping Center (BPC) at the Rochester Institute of Technology opened. NY-BEST members have priority access to the prototyping center dry room. Members also have access to manufacturing and assembly of lithium-ion pouch cells, training for employees on the prototyping line equipment, and prototyping technical assistance. Cylindrical cell battery prototyping capabilities have recently been added to the BPC as well. In the past year, the prototyping center has assisted many companies and is widely recognized as a critical resource in the state's energy storage network. The prototyping center works closely with the BTCC to ensure quality and reproducibility in the performance of the cells.[58]

A full list of NY-BEST organizational members can be found on page 9 of the 2020 NY-BEST annual report. https://ny-best.org/page/AnnualReport

At the Eastman Business Park, Li-Cycle opened a commercial facility with the capacity to process 5,000 tons of lithium-ion batteries per year. In 2023 the North American Hub is expected to open in Rochester with capacity to recover battery grade materials from the equivalent of 60,000 tons of lithium-ion batteries per year. Currently lithium-ion batteries can be recycled up to 95 % and the technology of the battery cells are rapidly advancing, increasing the viability of the technology.[59]

Electric Vehicle Policies

Planning and policy tools such as zoning and other land use regulations, as well as EV ready building codes and procurement procedures, can be used to allow, require, regulate, and incentivize EV charging stations. These tools can lower the cost and streamline the administrative process and be used to set design standards. This simplifies installations for both municipalities and developers and it ensures the safe installation and operation of EV charging stations. Below are several policies that are currently in place, and Section 4 will provide more planning tools and recommendations that can be used to increase the fleet electrification in the Genesee Finger Lakes region.

Federal Policies

On November 15, 2021, the $1.2 trillion Infrastructure Investment and Jobs Act (IIJA) was signed into law. This Bipartisan Infrastructure Law (BIL) includes $550 billion in federal investments to America's infrastructure over the next five years.[60] Allocation of the funds are indicated below:

- $7.5 billion investment to build out the electric vehicle charging network to support the White House's commitment to deploying a national network of 500,000 charging stations.[61]

- The $7.5 billion in funding is comprised of $5 billion National Electric Vehicle Infrastructure (NEVI) formula program and $2.5 billion in a discretionary grant program for charging and fueling infrastructure.[62]

- The NEVI program will dedicate funding to States to strategically deploy EV charging infrastructure and establish an interconnected network to facilitate data collection, access, and reliability. Each State is required to submit an EV Infrastructure Deployment Plan by August 1, 2022.[63] New York will receive $175,466,514 over the next five years upon an approval of the Plan.[64]

- The BIL provides an additional $7.5 billion for zero- and low-emission buses and ferries, with a goal of deploying thousands of electric school buses. A $5 billion investment in electric and low-emission school buses over five years will support the effort to decarbonization school buses around the country.[65]

- The BIL will invest $65 billion to rebuild the electric grid which will support the transition to wide scale deployment of electric vehicles.[66]

- The BIL provides extensive funding to support domestic manufacturing for EVs and related equipment, including more than $6 billion for programs to support a domestic supply chain for battery production and $750 million for advanced energy manufacturing facilities.[67]

- On December 14, 2021, the Secretary of Energy and the Secretary of Transportation signed a MOU to create a Joint Office of Energy and Transportation to accelerate the adoption of electric vehicles across the country. The Joint Office will focus on filling gaps in rural, disadvantaged, and hard to reach communities by providing technical assistance to States to strategically deploy EV charging infrastructure and develop State EV charging plans in equitable fashion.[68]

Figure 1.14

As of the publishing of this guidebook the funding is yet to be made available and will be distributed through each state DOT. The Joint Office of Energy and Transportation is continuing to develop guidance and the most up to date information can be found here: https://driveelectric.gov/.

State Policies

This is a list of state policies and laws that promote the use of electric vehicles.

- Senate Bill S6836 was signed by the governor in October 2020 to protect EV drivers' access to public charging facilities. Making it a violation of Vehicle and Traffic Law for a non-electric car to park in a space reserved for EV charging; it also requires that electric vehicles must be charging while using the designated spaces, and not just parking.[69]

- New York legislation S.2758/A.4302 requires the sale of all in-state passenger vehicles and trucks to be zero-emission vehicles by 2035. The sale of all medium and heavy-duty vehicles will need to be zero-emission by 2045, and all off-road vehicles and equipment by 2035. This was signed into law in September of 2021.

- New York has many rebates and incentive programs for municipalities to acquire EVs and build EVSE; there are also rebates and incentives for homeowners and fleet operators as described in Section 5.

- The NYStretch Energy Code 2020 version was developed by NYSERDA as a statewide model code for New York jurisdictions to use to meet their energy and climate goals by accelerating the savings obtained through their local building energy codes. The NYStretch offers several opportunities for a municipality to become EV ready. [70] In the Genesee-Finger Lakes region, the Village of Lima, Town of Geneva, and City of Canandaigua passed NYStretch in 2021.

Local Policies

Municipal leaders can play a key role in advocating for electric vehicle policies and incentives at the state and federal level that aid local government efforts. Municipalities can lobby for enhanced rebates and tax credits for electric vehicles and charging infrastructure, funding for municipal and public transit fleet conversions, and policies promoting vehicle to grid utility tariffs and electric vehicle-ready building codes. State and federal initiatives can help to drive action at the local level. Currently in the Genesee Finger Lakes region, most of our municipal zoning and building codes do not mention or define electric vehicles or the necessary EV support infrastructure.

- The City of Rochester recently added language allowing a minimum of 15% of parking spaces provided for buildings with facilities capable of recharging the batteries of electric and plug-in hybrid vehicles. All parking spaces provided for residents will be capable of having recharging facilities added in the future within the Village Center District zoning overlay.[71]

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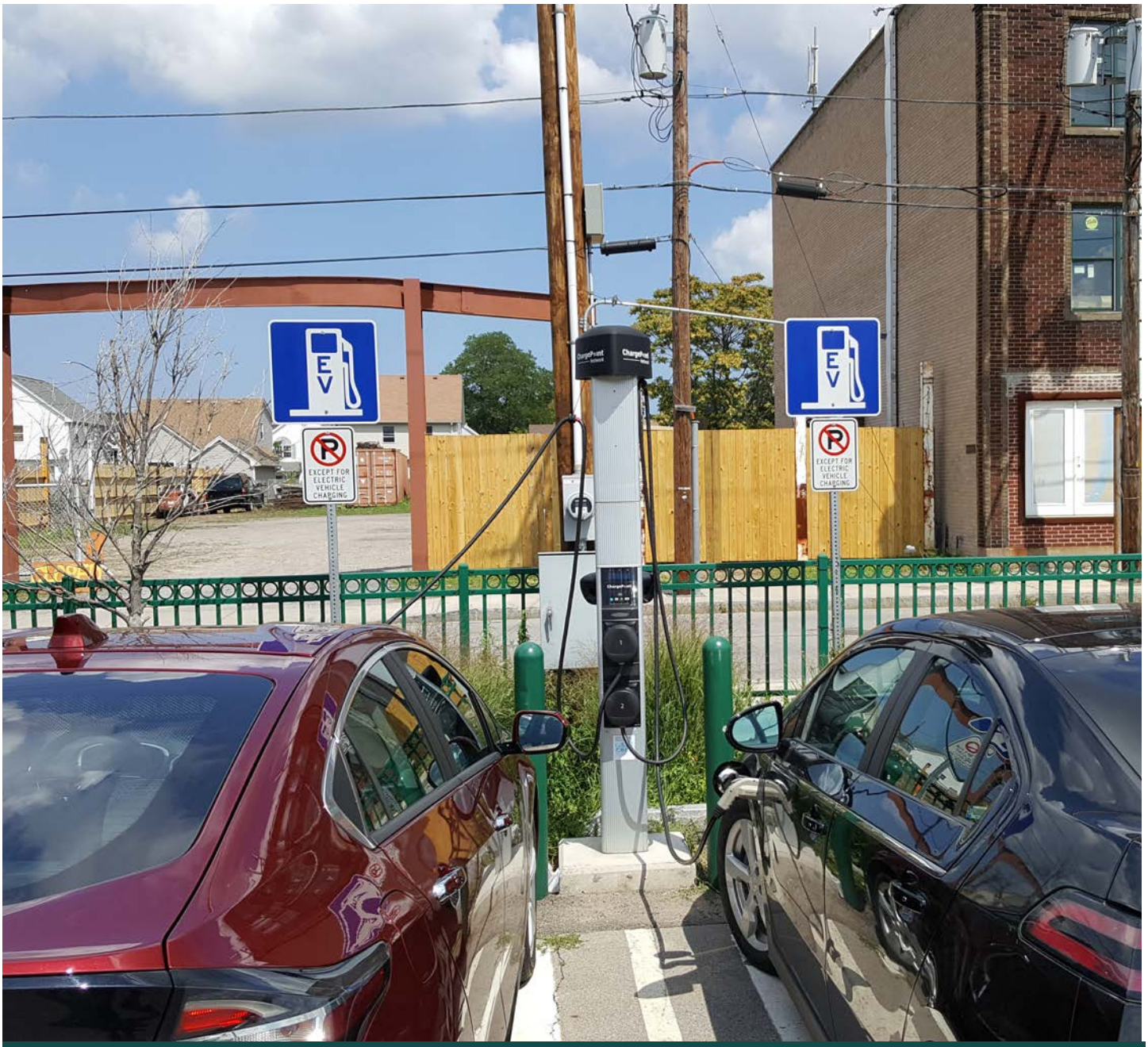

Section 2: Economic and Workforce Development

2. Economic Development

Transitioning our community to carbon-free electricity will create local jobs and drive economic investment. Workers will be needed to upgrade the efficiency of our buildings, install electric vehicle charging stations, upgrade our electrical grid and construct new solar and wind farms. As environmental stewardship becomes increasingly important to consumers, increased numbers of customers will patronize businesses and municipalities employing sustainable practices. The faster companies and communities evolve, the more income they can capture from environmentally conscious consumers. As more businesses, organizations, and individuals are looking to be good global citizens, a region aligned with carbon free power has the potential to attract them.

New York already has a highly skilled and well-trained workforce; but gaps exist in key skills needed for the transition to electric fleets. These skills gaps must be addressed, or our region and workforce risks being left behind. There are job opportunities in wind, solar, energy storage, renewable heating and cooling, and many other areas of the energy sector, but efforts must be made to connect New York's workforce with renewable energy career pathways.

United States Energy Sector Employment

The U.S. energy sector job growth outpaced the overall economy until 2020 when the energy sector was deeply affected by the COVID-19 pandemic. The energy sector lost 840,000 jobs, a loss of 10% between the end of 2019 and the last quarter of 2020.[1] It will take critical investments in our infrastructure to recoup the job losses from 2020 and return the energy sector to positive growth rates. Investments in our electrical grid infrastructure, alternative fuel sources and building electrification will be the key to supporting this job growth.

The motor vehicle and components parts sector of the economy also lost a substantial number of jobs due to the pandemic. This sector lost more than 230,000 workers, a loss of 9% in the manufacturing, maintenance, wholesale trade, distribution and transport and professional business industries. However, the alternative fuel vehicles and hybrids including electric, and hybrid electric vehicles industries saw an increase of 7,300 jobs. [2]

New York State Energy Sector Employment

New York State has made great strides in increasing clean energy jobs primarily due to the Climate Act. New York saw a 3.2% increase in clean energy employment between 2018 and 2019, three times faster than the overall employment growth rate in the state, and nearly three times faster than national clean energy job growth rate. [3] The COVID-19 pandemic has temporarily reversed this momentum. Between the end of 2019 and the end of 2020 clean energy jobs in New York decline by almost 4%, a loss of 6,000 jobs in 12 months.[4] During the height of job losses in the second quarter of 2020, clean energy employment in New York had declined by almost 13%. However, the clean energy sector has continued to rebound over the following quarters. At the end of 2020, clean energy employment in New York was still about 12% higher compared to the 2015 baseline.[5]

Despite economy-wide job losses, alternative vehicle employment in New York climbed during the COVID-19 pandemic. This sector saw jobs grow by almost 5%, a net increase of nearly 400 jobs. This job growth was driven largely by the hybrid electric and electric vehicle sub-technologies, mirroring national trends. The hybrid electric sub-technology grew by 12% and the EV sub-technology grew by 8% between 2019 and 2020. The remaining sub-technology categories plug-in hybrid, natural gas, and hydrogen and fuel cell vehicles all saw job losses between 2019 and 2020 as shown in Figure 2.1.[6]

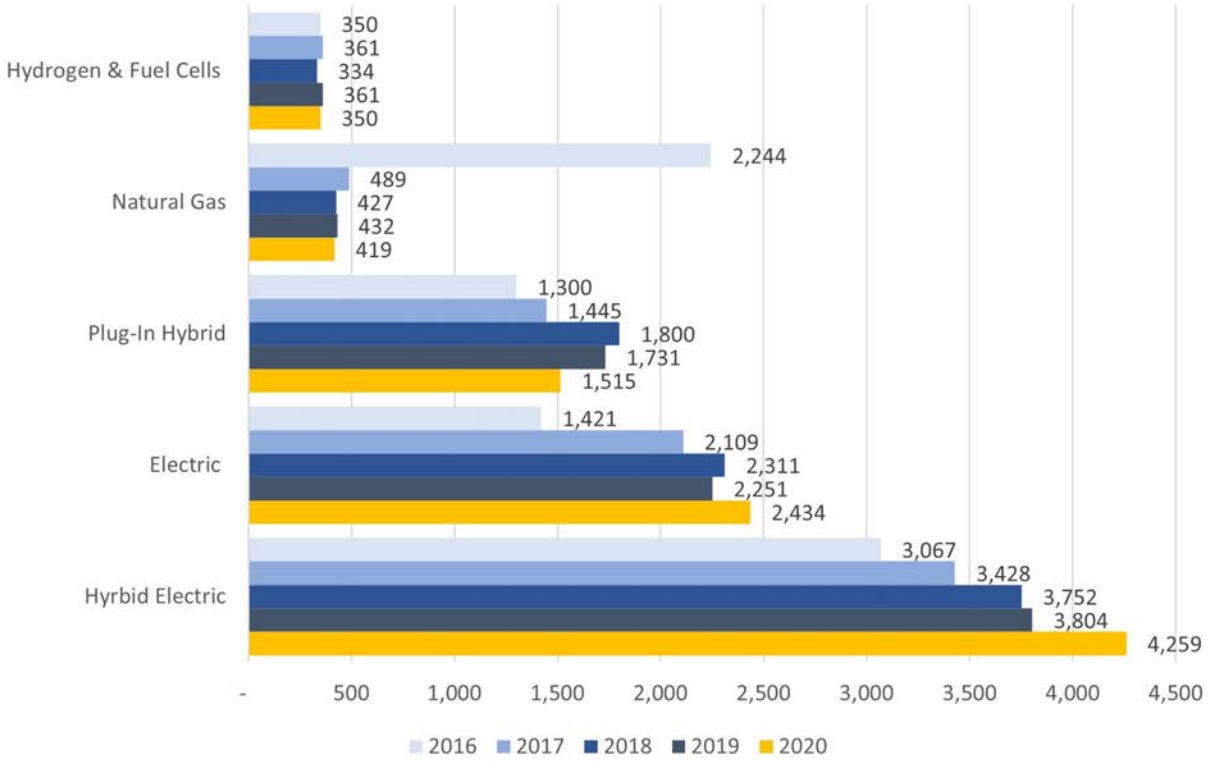

Figure 2.1: Alternative Transportation Employment by Technology, 2016-2020

There are only specific sectors of the manufacturing industry that are most likely able to support the growth of electric vehicle adoption. These include machinery manufacturing, computer and electronic product manufacturing, and transportation equipment manufacturing. As a proportion of total manufacturing in the State, alternative transportation-related manufacturing stands for 16% of all manufacturing establishments and 30% of all manufacturing employment.[7]

Alternative transportation supply chain industries have heavy concentrations of establishments and employment across three counties- Erie, Monroe, and Suffolk, as shown in Figure 2.2.[8] In total, 36% of employment and 35% of business establishments from the alternative transportation supply chain are in these three counties. Monroe County and the proximity of Erie County present an opportunity for the Genesee Finger Lakes region to be a hub for alternative transportation manufacturing and employment.

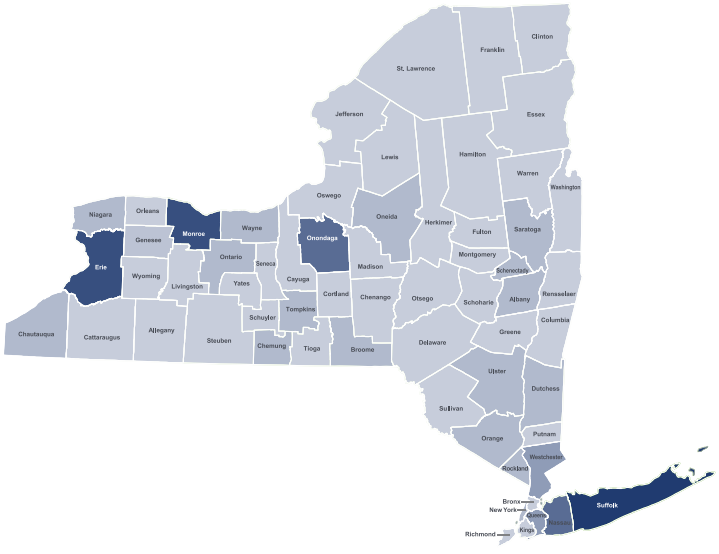

Figure 2.2: Alternative Transportation-Related Manufacturing Establishments, By County, 2020

A survey of New York's potential universe of alternative transportation supply chain industries show the State is poised for advanced electric vehicle supply chain growth. Of the surveyed manufacturers 65% stated their organization has excess production capacity, meaning they could produce more goods and components given added investments of capital. 68% indicted that they were interested in the opportunity electric vehicles presented to their businesses.[9] Potential electric vehicle manufacturers showed they would require policy, capital, equipment access, and talent workforce support to take part in and support the alternative transportation market. Of those, 58% said they would need to make significant capital investments to serve the electric vehicle industry and 47% of firms reported their staff would need additional training to serve the electric vehicle industry.[10]

Workforce Development Survey

To meet New York's sustainability and electrification goals, having a qualified workforce to develop, install, and maintain electric vehicles and charging infrastructure is paramount. Regional workforce development agencies completed a workforce readiness survey to determine whether the regional workforce and employers are ready to make the shift to electric vehicles; this section discusses their answers. The full interview questions are in the Appendix C.

Is Our Region Ready?

The workforce development partners believe that employers will be looking for electrical and mechanical technicians, quality control and assembly personnel, as well as employees with maintenance and repair skills. Partners believe that training in those areas will be necessary, especially in the maintenance and repair roles of newer technology. Partners noted that there is still a high importance for basic soft skills such as being on time, math, and communication skills.

The regional workforce development partners recognize are several challenges for the Genesee Finger Lakes Region's shift to electric vehicles. Their concerns fall into three categories:

- The challenge for small auto repair shops to be able to maintain and repair EVs.
- Capacity of local IBEW training programs.
- The lack of formal training for non-union members.

Many small independently owned shops in our region are already servicing EVs, however, there is concern that it may be more challenging for smaller shops to service EVs, over their larger shop competitors. To work on EVs, shops need to have a combination of advanced Information Technology auto technology with diagnostic software and scanning equipment. Shops will need to determine the time and effort involved to prepare for EV repairs and maintenance; much of this will depend on the size and scope of the shop and the general adoption of electric vehicles within the area, which will indicate demand for their services. Larger dealership mechanics, especially in areas where EV adoption has been more prevalent, are receiving training from the dealership, while small shops may not be receiving that training. Current workforce shortages may also be contributing to a shop's inability to pivot towards EV technology.

The International Brotherhood of Electrical Workers (IBEW) Local 86 in Rochester offers a five-year apprenticeship program that includes a combination of both classroom and on-the-job training. The apprenticeship program includes becoming an electric vehicle infrastructure certified installer as part of the electric vehicle infrastructure training program (EVITP). The EVITP training is only offered to those in the apprenticeship program. Specifics about the EVITP training is included in Section 5.

The IBEW Local 86 has seen 35% increase in enrollees to their apprenticeship program over the last couple years, and while they would like to continue to expand the program more, they want to ensure that there are enough union jobs available to the graduates of their programs. The IBEWs statewide are tracking green energy and infrastructure work, from EV equipment to solar and wind power. They estimate that industry will need hundreds of electricians for the solar industry alone. There is demand for this work and for workers, but as they look to expand their apprenticeship programs, they are unsure if they can place all their trained electricians into the field.

Most employers in the green energy fields are tied to construction related unions, all of whom offer training available to their union members and not to the general public. It will be important to survey local employers to identify what type of skills are necessary when developing programs for the public for those entering these types of jobs. A more robust volume of training opportunities available to meet the demands generated by an all-electric personal vehicle and all-electric fleet scenario. There is likely a role for workforce development boards and one-stop career centers, and probably community colleges, as well, if a full-scale training platform was to be created. In addition, the NYS Department of Labor should be asked to provide funding to help support this expansion and transition of services.

How Can Workforce Development and One Stop Partners Assist Local Workers and Employers?

Regional workforce development partners believe that to make this transition easier partners should work together to create new training programs that will prepare workers for entry into green technology manufacturing jobs. This will likely be a multi-partner approach, with federal or state-funded grants that allow workforce development entities, community colleges, employers, unions, and community-based organizations to all contribute to the effort. A well-coordinated plan among these parties will ensure that opportunities are not missed, with respect to skills gaps. This will also ensure that the shift to this new technology is just and equitable.

Most green technology manufacturing jobs are traditional occupations that now require increased and/or different skills. To support both local workers and employee's workforce partners are committed to:

- Working with businesses to ensure that their jobs are good jobs and can be long term careers. (Good jobs are jobs with good pay, steady hours, and opportunities for advancement). Jobs with good pay and benefits will decrease industry turnover.
- Marketing good jobs to prospective workers.
- Connecting prospective workers with opportunities to train for those good jobs.
- Recruiting in underserved communities.
- Supplying necessary support to help prospective workers to succeed in training for and to retain and advance in those jobs.
- Partner with unions as they look to expand apprentice program and support the creation of training for individuals who are not union members.

Regional partners will need to support businesses by helping them to overcome any barriers to equitable treatment of their workers, including any artificial barriers in the hiring and advancement of their workers. Now is the time to approach employers—when they feel the need for skilled workers most acutely. Partners also recognized the importance of needing to examine their own processes as one-stop system and end any less-than-optimal use of resources. Flexible support and caring staff who are empowered to help and recruit individuals into these fields.

Supporting in School Youth

Regional workforce development partners recognize the importance of aiding schools and businesses to educate in school youth about potential opportunities in green energy and manufacturing careers. To fill these types of positions not just today but in the future the workforce partners can play a significant role in getting youth excited about these careers and career pathways early on. This can be through work experience, internships, mentoring, informational interviews, industry fairs and youth apprenticeship opportunities. Resources for students and parents include:

- Finger Lakes Youth Apprenticeship Program: Was launched in the Fall of 2019 by the Rochester Technology and Manufacturing Association and Monroe Community College. The Finger Lakes Youth Apprenticeship Program partners with Career and Technology Education programs like BOCES and WEMOCO, Edison Career and Technology High School, and 21 additional local employers to match more than 50 high school students with job shadows and paid co-ops.[11] In the spring of 2021 the Finger Lakes Youth Apprenticeship Program held "Signing Day" events at the Genesee Valley BOCES and the Wayne Finger Lakes BOCES centers. These events are modeled after the NFL's high-energy, suspense-filled Draft Day. These events features contract announcements, official signings between students and employers, photo- opportunities, and team swag to support the first steps to bright careers for regional youth.[12]

- GLOW With Your Hands**:** Is an annual hands-on career exploration event for GLOW (Genesee, Livingston, Orleans, and Wayne County) region students, put on by the GLOW Workforce Development Board. The event highlights high-growth and high demand careers in agriculture, manufacturing, and skilled trades in the region. Students can take part in a variety of activities including welding, bricklaying, electrical wiring, heavy equipment operation and more. The next GLOW With Your Hands event will be held on September 27, 2022.[13]

Figure 2.3

- Finger Lakes Works... With Their Hands: Is an annual skilled trades and advanced manufacturing career exploration event. Every year, several hundred students and school personnel from area high schools and BOCES districts attend this exciting event. More than 50 businesses, trade unions, colleges and organizations provide hands-on demonstrations and activities for the students including welding, soldering, nail driving competitions, engineering skills, bricklaying, electrical wiring, the actual operation of heavy equipment and more. The next Finger Lakes Works event will be held on May 25, 2022.[14]

Figure 2.4

Will Our Shrinking Workforce and Population be a Challenge to Make this Shift?

Regional partners all agreed that challenges due to shrinking population are certainly a possibility, but there are also opportunities. Supporting school education programs to introduce students to in demand green energy careers will be paramount especially as the Baby Boomer generation retires.

Regional employers need to be aware of other factors that may affect hiring practices in these fields such as worker transitions occurring because of pandemic-related shifts and job reductions and eliminations. It is difficult to predict how much movement there will be, with respect to job seekers changing careers and seeking new opportunities. With such stringent competition for skilled workers, it is important to ensure that these jobs offer career ladders with family-sustaining wages, and to promote these factors to students and potential career changers.

How do we leverage current opportunities and position the Genesee Finger Lake Region to become a hub for green technology?

Workforce partners believe that to leverage these opportunities they must be approached by both economic development and workforce development leaders jointly. For the maximum impact to be achieved for the region, both groups must be well-coordinated from beginning to end. Partners recognized the importance of strong local connections to keep local companies and have them expand into and be committed to our region. There is hope that these local connections will incentivize making our region a great place to live and work while ensuring our companies are owned and operated by local community stewards.

To leverage regional opportunities and counteract the regions' shrinking workforce is to identify important transferable skills that can be utilized in the expanding market of electric vehicle automotive technology.

Transferable skills and knowledge from a traditional auto technician to electric vehicle technician include but are not limited to:[15]Vehicle mechanics

- Motor design
- Vehicle and system integration
- Testing, validation, and certification process
- CAN and related protocol knowledge
- Control system development
- Understand prototyping-hardware design, software development, EMC compliance, and functional testing
- Analytical, problem-solving, and creative skills
- Ability to analyze, troubleshoot, and make repairs
- Communication skills and customer service

With increased availability of computer system diagnostics training and electrical safety transitioning current general auto mechanics can be made easier.

Economic Development in Genesee Finger Lakes Communities

The transportation sector is the largest contributor to GHG emissions in the U.S. disproportionately affecting low-to-moderate (LMI) and minority communities. To meet the decarbonization goals of the country and the state more work will need to be done to ensure equitable access to electric vehicles. The communities most impacted by pollution and poor air quality are not always seeing readily accessible EVs.

Disadvantaged communities are defined by NYSERDA and the Climate Act as communities that are located within census block groups that meet the U.S. Department of Housing and Urban Development (HUD) 50% AMI threshold, that are also found within the Department of Energy Conservation (DEC) Potential Environmental Justice Areas or are located within New York State Opportunity Zones. The region's Disadvantaged Communities are shown in blue in the Figure 2.5. [16]

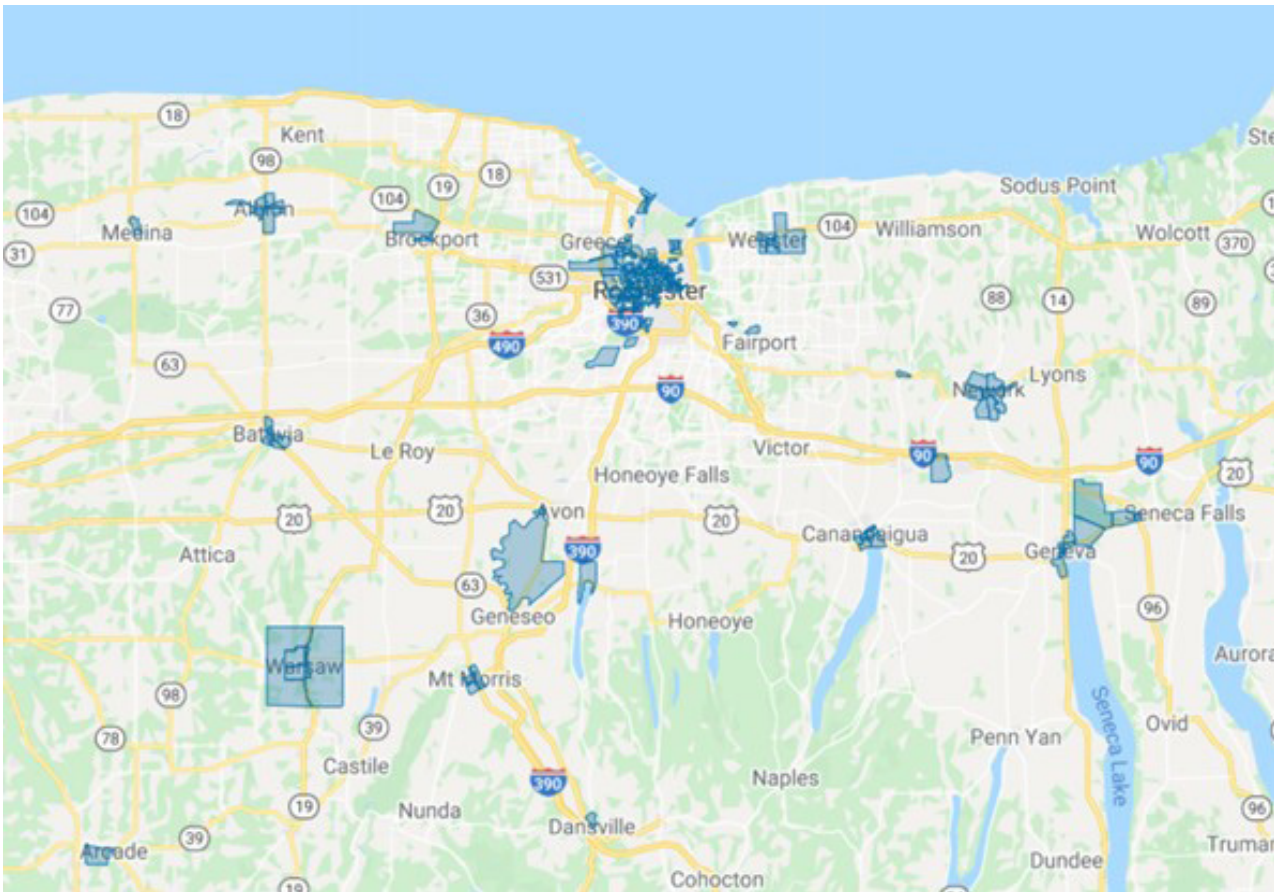

Figure 2.5: Disadvantaged Communities in the Genesee-Finger Lakes Region

Research shows a disproportionately small number of electric vehicles have been sold in LMI and disadvantaged communities, and households in these communities are less likely to have access to charging whether it be at home, work, or within their community. These communities typically have smaller municipal budgets for vehicle purchases, to replace traditional ICE vehicles with EVs and install public charging stations.[17]

It is in these areas that policy makers should look to expand EV charging networks, deploy EV buses (both public transit and school buses), and support residents and municipalities to purchase these vehicles and needed charging infrastructure. Electrification in these communities will only be possible through greater support from policymakers as addressed in Section 4.

Low-income households and disadvantaged communities in the Genesee Finger Lakes Region could benefit from electrified transportation options. Low-income households are affected by transportation emissions; they are more likely to live in or near areas of high traffic and spend a higher proportion of their household income on transportation costs. For example, the lowest income households spend approximately 11% of their annual income on fuel, maintenance, and repairs compared to all other households that spend 4.5% of their annual income on vehicle related expenses. Replacing internal combustion engine vehicles in low-income and disadvantaged communities and communities of color will reduce local air pollution, and the lower maintenance and fuel costs could alleviate strain on household budgets.[18]

New York has some of the highest average electricity costs, however charging an EV is still more cost effective than filling up at the gas pump. EV drivers could save more than $770 per year on annual fuel costs compared to a gasoline powered vehicle.[19] While the price of electricity can vary among providers across the state, the average cost is much less volatile than that of gasoline. Electricity prices tend to rise during the summer due to increased demand, but year-to –year variations are low. Regional and national gas prices on the other hand vary greatly and unpredictably. EV drivers both individuals and municipalities will benefit from lower and more predictable fuel costs from EVs, while gasoline-powered vehicles expose car buyers to potentially large increases.[20]

Electric Vehicles and Tourism

Tourism in the Finger Lakes has been a huge economic driver for the region. In 2019 tourism was a $3.3 billion industry supporting 58,248 jobs.[21] Due to the pandemic, visitor spending in the region plummeted 40% in 2020, losing almost 17,000 jobs. Much of region has had to refocus and craft critical messaging centered around the products and residents of their own communities.

The region is a must-see destination for outdoor activities whether it be hiking, boating, skiing, or ice skating there is something for everyone to enjoy during all seasons. Promoting the Finger Lakes region as an all-season destination will continue the trend of local and regional promotion emphasizing the five-hour driving market as the regions key geographic market.[22]

Looking to pull from the five hour driving market to enhance tourism opens the area to increasing and enhancing their electric vehicle infrastructure to attract more guests to local communities and to downtown businesses. If people know that they can charge the vehicle in your community, they will stop to shop, eat, take in the natural scenery, and maybe stay overnight in a local hotel. Charging station infrastructure will increase the exposure within community as guests, media, and prospects notice charging stations and the community's commitment to the goals of the Climate Act.

Communities and business in the Finger Lakes Region regardless of size can gain the reputation as an EV charging hub, that also are great places to grab lunch or shop while they are fueling up. Creating an EV tourism plan and marketing campaign that maps likely destinations for EV tourists and highlighting EV-friendly routes would replace an EV user's range anxiety with range confidence to spend time within your community.

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Figures:

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Section 3: Regional Case Studies

3. Case Studies

To build confidence in fleet managers that they can make the switch to alternative fuel sources, three case study partners were selected to provide insights into their fleet electrification process. Each of the three case study partners were asked a series of questions breaking down their motivation for change, their implementation process, their fleet solution, costs, training and maintenance needs, as well as the impacts and lessons learned during the process. The full case study interview questions are in the Appendix D.

Fairport Electric

The Fairport Municipal Electric Commission (Fairport Electric) is a Village owned municipal electric company that serves 18,000 customers in the Village of Fairport and the Town of Perinton with electricity. The company provides customers with 100% carbon free and over 85% green electric. Most of the electricity supply comes from the NYPA's Niagara Power Project. Fairport Electric currently has 112 fleet vehicles for several departments.

The Village of Fairport was the first municipality in Monroe County to buy a hybrid vehicle and to purchase a Toyota Prius. The goals for EV adaptation were in line with the Village's sustainability goals in trying to do a small part of emissions reduction and do it within a limited budget and abilities. The Village considered fleet vehicles to be one of the simplest moves to make first. Fairport Electric worked with fleet managers and shared information about electric vehicles with the community through open houses and other public events. These events highlighted the EVs and the progress that Fairport and Perinton have been making.

Electric Vehicle Fleet

Over the last 15 years, Fairport Electric bought over 20 hybrid and all electric vehicles; all of which are signed and marked with green vehicle information. The utility started with three Toyota Prius, two Ford Hybrid Escapes with all-wheel drive (AWD) capabilities as well as a Chevy Silverado hybrid pickup. These were all early generation vehicles and go back over ten years. As vehicles needed to be replaced, the Prius were replaced with a Chevy Bolt, a Nissan Leaf, and

Figure 3.1: Fairport Electric

a Chevy Volt. One of the Escapes was replaced with a Chevy Volt and the other with a Mitsubishi Hybrid Outlander. The Chevy Hybrid Silverado was replaced with a Ford F250 XL Fleet Plug in hybrid currently being used by one of the supervisors.

Fairport Electric has also replaced four of their six large bucket trucks with plug in hybrid bucket trucks where all hydraulic functions now work off their batteries instead of fossil fuels. This battery system also feeds the cab comfort system which takes care of HVAC needs instead of idling fossil fuel engines. This system comes from the bucket manufacturer Altec Industries and goes by their trade name of "JEMS." The large digger derrick was replaced with a similar "JEMS" setup.

The Fairport Police Department has transitioned their ICE engine vehicles over to hybrid electric vehicles and hopes to make the transition to plug in electric vehicles. These existing hybrid vehicles have greatly reduced idling time and have shown to have no reduced capabilities for the police department. They are hoping that as more manufacturers build true EVs to include pickup trucks, SUVs and other hardened equipment that can be added to their fleet.

Equipment Procurement

Purchasing hybrid and electric vehicles has cost Fairport Electric approximately $400,000 in total over the last 15 years. Fairport Electric has also spent approximately another $75,000 on replacing mowers and chainsaws with battery operated models. Vehicles are put out to bid so they can come be acquired locally or from across the country. As a government owned tax-exempt organization, Fairport Electric is not eligible for tax credits, however they were able to use other funding sources such as:

- Federal rebates to fund small electric vehicles
- NYPA funds for larger vehicles. This involved zero interest loans with repayment completed through the rate base. This initiative helped Fairport Electric meet certain green energy mandates that they are required to carry out as a municipal electric company.
- Independent Energy Efficiency Program (IEEPNY.com) funds funded smaller tools like electric chainsaws.

Fairport has bought a variety of charging stations throughout the years, some are networked, and some are not. The networked stations were acquired through EV Connect (software) and PowerCharge (hardware), a local manufacturer, and the residential units have been installed with a partnership with NYPA's EVolve program and the Electric Power Research Institute through Skytronics.

Fleet managers and supervisors used a qualifications-based procurement process with specific criteria to select vendors. The first criteria were usability of the equipment for fleet managers and drivers. If the new vehicles and equipment were going to cause too much change, then the product would not be utilized enough to minimize impact. Fairport Electric looked at vendors with whom they could build long-term relationships, realizing that there would be challenges with adapting innovative technology. By using typically larger long-term vendors there was support for the infrastructure over the terms of product use.

Training and Maintenance Changes

Fairport Electric saw early on the importance of having the necessary technical staff and training to repair and work on the equipment. Electric vehicles like other new cars are very technical and having to plug a laptop into the car to diagnose issues was new to some mechanics so training was offered to their staff. The extent of the training was dependent on the vehicle. For passenger vehicles, the training was straightforward, including having staff drive them,

look at the battery gauge, and show staff how to plug the vehicles in and go over starting procedures. The more complicated vehicles, like the battery bucket trucks, require the manufacturer to host a training session with all drivers. The assigned truck drivers and the mechanics receive more in-depth training from the manufacturer which includes on-site and virtual training. Fairport Electric also purchased required testing equipment needed to work on the EV platforms which also required additional training for staff. Fairport Electric increased their training budget for their staff to support the transition to electric vehicles.

The utility also has made changes to their service schedule to accommodate the elimination of idling hours and had to switch some services over to follow the power take-off hour meter instead of the engine hour meter. Fairport Electric did see vehicle miles per gallon double for their large vehicles. By eliminating idling hours, annual fuel consumption dropped by approximately 10-20%. Colder weather and a colder climate affects the performance of the batteries, so the greatest positive impact can be seen in the warmer months.

Impacts

As a result of adopting EVs, Fairport Electric has seen a reduction in fuel costs and some maintenance costs like brakes and other wear items. Brakes are replaced less often, and there is less servicing of engines. However, these savings were offset by the purchase of different equipment or training to keep these vehicles. In addition, while wear parts lasted longer, structural parts failed quicker. Without normal maintenance and replacing of wear items, structural parts were looked at less, which sometimes led to issues. As a result of these observations, Fairport Electric is evaluating their maintenance schedule. The maintenance network has not caught up with the products that are currently available. This is most noticeable when a vehicle needs warranty work done from the dealership, but the dealership has never seen the product or does not have trained technicians to do the work. This causes delays in the work.

Fairport Electric offers some of the lowest cost electric service in the nation, so tracking electric costs were not paramount to the project. Currently they are installing charging infrastructure with networking capabilities that will gather electric usage in the future.

The biggest health impact was the reduction in noise as engines were no longer running to turn hydraulic pumps or chainsaws were not screaming to remove trees. Battery operated vehicles and equipment allowed the employees to communicate better and be safer on-site.

One of Fairport Electric's early mistakes was not pairing an open-minded employee with the new electric technology. If the individual is not open to the idea of EV technology, there will be problems and challenges with utilization. Once the importance of employee pairing was realized the equipment sold itself and then the rest of the employees bought into it as their peers used it and shared the advantages.

Depending on the source of the product, Fairport has had a positive experience if the product has been proven and tested well. The negative impacts experienced were typically a manufacturer releasing a product before it is ready and hence giving the users a negative experience with the product. There is a high downtime rate for some of the products and typically it can be traced to a generation of one type of product that is brought to market maybe too early. Unfortunately, the downtime affects maintenance and parts are more expensive when they are needed.

Fairport Electric staff see EVs as the future but are concerned that the rush to market them will put negative experiences at the forefront at times. If the infrastructure is not there to charge them or fix them, then there is concern about negative public perception of the vehicles.

City of Rochester

The City of Rochester has a population of around 211,000 people according to the 2020 U.S. Census and operates a fleet of approximately 1,300 vehicles. A workforce of about 3,500 employees operates this fleet, which includes diesel, gas, and electric garbage trucks, snowplows, street sweepers, pickup trucks, vans, and sedans, as well as small utility vehicles. To meet the City's Climate Action targeted greenhouse gas reduction goals, Rochester looked to reduce their transportation related emissions. Through developing the Climate Action Plan and engagement with the staff of the Parking Violations Bureau, the Police Department, and the Water Bureau, the City was able to transition several of their traditional ICE vehicles to electric vehicles.

Rochester's Electric Vehicle Fleet

To date the City has purchased ten sedan plug-in vehicles (i.e. all electric Chevy Bolts, and plug in hybrid Chevy Volts), as well as several electric utility carts, Segways, club cars, and electric utility lift. The Water Bureau and Parking Violations Bureau utilize both the Bolts and the Volts, while the Police Department (for traffic control) utilizes the Volts as downtown maintenance vehicles. Level 2 charging infrastructure was installed at each of the municipal parking lots that the vehicles are parked in when not in use.

The City purchased several of the Chevy Volts with regular capital funds, but most of the electric vehicles and infrastructure were purchased utilizing funds from several sources that assisted in paying for incremental costs.

Figure 3.2: City of Rochester

Sources included:

- American Recovery and Reinvestment Act
- NYSERDA funding to purchase some of the Bolts and Volts
- NYSERDA and Energetics funding for the installation of charging stations
- DEC Zero Emissions Vehicle (ZEV) rebate program
- Federal Congestion Mitigation Air Quality (CMAQ) funds

Equipment Procurement

The networked stations that were funded through NYSERDA were selected by Energetics, while other stations were bought utilizing the internal vendor selection process through the Equipment Services Bureau in each department. Vendors used included but not limited to: Joe Basil Chevrolet, Emerling Chevrolet, and Club Car of the Alleghenies.

Rochester purchased all their vehicles off state contracts and primarily bought Chevy vehicles. Rochester spent $32,672 on the Chevy Bolts with an average $10,673 vehicle in grants funding. The networked ChargePoint stations were installed at no cost to the city with NYSERDA funding, and the non-networked stations were approximately $3,000 each, including installation.

Training and Maintenance Changes

While the City of Rochester has not found too many challenges in training the staff or in the transition of their maintenance routine, they have had to be aware of the differences in maintenance rotations. The electric vehicles are still under warranty, so the city has partnered with local dealerships to learn more about the differences in the maintenance rotations between internal combustion engines and EVs. There is no need to change the oil, transmission fluid, spark plugs, fuel filters, or drive belts with an EV. This means that the vehicle rotation schedule can be much longer, allowing EVs to remain in service longer. City officials expect that as staff continue to gain knowledge of the maintenance process, increase the size of their electric fleet to meet more of their Climate Action Plan goals and reduce GHG emissions.

Impacts

From the purchase of fully electric and plug in vehicles, the City of Rochester has seen fuel and maintenance cost savings. The fully electric Bolts have cost the city on average 11 cents per mile and will cost an estimated $8,250 over the lifetime of the vehicle (75,000 miles) in fueling and maintenance costs. According to the American Automobile Association (AAA) it costs on average small sedan 15.67 cents per mile in fueling and maintenance costs and with gas prices projected to rise so will the costs of ICE vehicles.

The City of Rochester has engaged the public in several community outreach events to showcase its electric vehicles The City took part in the Rochester EV Accelerator program and the National Drive Electric Week promoting the purchase of personal EVs with ride and drive events and highlighted one of their electric police vehicles. By buying these vehicles, Rochester has seen an increase in community awareness of EVs and EV supportive infrastructure. The expectation is that as community members see these vehicles in action, they will consider purchasing one as well.

Rochester completed a municipal GHG inventory for the baseline year of 2008 in 2010. That GHG inventory showed that 36% of its municipal GHG emissions were due to on-road vehicles (11,818 MT CO2e). They are in the beginning stages of updating the municipal GHG emissions inventory to see if they met the target GHG reduction goal of 20% by 2020.

More recently the City has seen some difficulty in buying EVs (Bolts) due to the battery recall issue and other supply chain problems. Even with those challenges, the City is still committed to adding EVs to their fleet as rapidly as possible.

Rochester Genesee Regional Transit Authority

The Rochester Genesee Regional Transit Authority (RGRTA) is a regional transit authority set up by New York State in 1969 to provide public transit services to the nine-county Genesee-Finger Lakes Region. RGRTA has more than 900 employees serving customers and businesses through subsidiaries in Monroe, Genesee, Livingston, Ontario, Orleans, Seneca, Wayne, and Wyoming counties. RGRTA's subsidiary for Monroe County, the Regional Transit Service (RTS), is recognized as one of the best-run transit systems in the nation by partnering with the community. RTS provides safe and sustainable mobility, offering better access, frequency, and reliability to more than 15 million people each year, connecting their customers to jobs, school, healthcare, shopping, and recreational activities.

Regional Transit Service's Electric Fleet

The electric bus project at RTS started in 2017 when the State announced grant funding for five electric buses and associated charging equipment. The initial purpose of the electric bus project was to reduce the carbon footprint of major transportation systems across the state and to support the electrification of public transit systems. The project has since expanded with the passing of the Climate Act in 2019. RTS is mandated to transition 25% of their 40- and 60-foot bus fleet to zero emission by 2025 and 100% by 2035. Through this effort, RTS is leading Upstate New York transit agencies in deploying electric buses. RTS has engaged with the U.S. Federal Transit Administration (FTA), New York State DOT, NYPA,, NYSERDA, and Rochester Gas & Electric.

In October 2020, RTS celebrated its first ten electric buses in operation. The ten 40-foot class 8 battery electric heavy-duty transit buses required an additional circuit breaker and distribution panel, power units, and dispensers. RTS is in the process of constructing a new transformer and switch gear to support the ten additional buses RTS is receiving first quarter 2022.

Equipment Procurement

The first phase of buses and infrastructure cost approximately $2 million with the help of several funding sources. Sources included:

- CMAQ funds
- U.S. FTA Low or No Emission Vehicle program funds
- Volkswagen settlement funds
- Electric Vehicle Charger Make-Ready Program through Rochester Gas & Electric

Figure 3.3: Regional Transit Service

RTS has developed separate request for proposals for battery electric buses and for the required EVSE. Bus selection criteria included price; quality assurance; needed physical attributes; performance (i.e. electrical specifications, range, and recharge rate); delivery and available training and technical support. RTS ultimately purchased buses from New Flyer. Buses have a two-year bumper to bumper warranty and New Flyer supplies a service technician to help perform warranty work alongside our technicians.

Charger selection criteria included quality of charging system design and performance; available training, technical support, and warranty from the company; and the price. RTS purchased charging equipment from BTCPower utilizing EV Connect software.

Training and Maintenance Changes

The organization has had to develop electric bus training modules and plans to bring all the technicians up to speed on how to diagnose problems and repair the new buses. Capital purchase included at least $80K of vendor training to support the development of training staff which has included more training on high-voltage safety, PPE and first responder training has also been implemented. RTS will be installing additional fall protection on the maintenance bays due to the batteries and the high-voltage components located on the roof.

RTS is currently working on how to address the operational process changes that are needed to account for the four-to-five-hour recharge time and range limitations that can vary based on the outside temperature. This may also require additional training.

Impact

RTS has spent roughly $40,200 on electricity (annually) to charge the ten electric buses currently on the road. The equivalent diesel cost RTS would have spent for the miles traveled would have been around $108,000, seeing a $67,800 in fuel cost savings over the course of a year. These significant cost savings will support covering the increase in electricity costs that the organization has seen.

As of January 2022, RTS has seen many technical issues with the buses and chargers due to the technology; the electric buses are down for repair more often than our diesel buses. Due to this issue, RTS is unsure of the potential maintenance costs savings they may see from the electric buses.

The time needed to charge the buses and range limitations, especially in cold weather make it difficult to scale this technology across the entire fleet even when assuming battery technology advancements. With the acquisition of ten more electric buses to be delivered in 2022, the organization can evaluate reliability and performance of the vehicles as they scale to 100% zero emission fleet by 2035. However, the current assumption is to get to the zero-emission goal the fleet will likely need to include hydrogen fuel cell buses.

RTS also noted that electric buses are helping reduce health and environmental impacts across the region. Electric buses will help cut smog and GHG emissions in areas where people congregate such as bus stops and schools.

Valuable Insights

Fairport Electric, the City of Rochester, and RGRTA have all had positive experiences in adding electric vehicles to their fleets. While there are challenges of high capital costs, training, and ensuring that the right staff are involved and engaged, all three agencies are looking for solutions to increase EV fleet capacity.

Long term strategic planning is necessary to decide an effective strategy for fleet electrification and potential future build-out. Fleet managers need a noticeably clear understanding of how their current vehicles are being used; how far they travel, and under what conditions they must operate, before introducing electric vehicles. Fleet analysis must focus on individual vehicles to decide the right vehicle for the job. This will help answer the question: Do all fleet vehicles need to be fully electric, and if not, which vehicles in the fleet are the right candidates for switching? Engaging with the vehicle users to find the needs and important features required and desired in new fleet vehicles is important. This process will help determine who will be the champion of this change, and who can assist in educating others on the benefits of fleet electrification.

Long-term strategic planning for electric vehicles should include ways to engage with the community and publicize the benefits of fleet electrification. Publicizing the community benefits of electrification may encourage private citizens to become interested in EVs for their own use. To help offset the capital costs of fleet electrification, a list of current funding sources for both vehicles and infrastructure is available in Section 5.

Most importantly, the case study partners showed that fleet managers looking to transition to electric vehicles must be patient and open minded. This new equipment will work differently and there may be different ways agencies can use this equipment to meet their needs.

Figures:

Section 4: Recomendations

4.Recommendations

Making the transition to electric vehicles will not only ensure New York can follow the goals of the Climate Act; the transition will also ensure that we reduce emissions, improve air quality, and cost savings. To see the full circle of benefits that electric vehicles and other alternative fuel sources can provide federal, state, and local policies will need to be updated and future proofed. Municipalities, developers, and community planners, architects and engineers will all need to develop design standards that accommodate EVs and other alternative fuel transportation. Implementation strategies and fuel alternatives should be considered for the Genesee Finger Lakes Region to make the shift to greener technologies.

Significant action has already been taken across the globe to make this transition to alternative fuels. Fiscal incentives such as subsidies and tax rebates have spurred the first uptake of light-duty EVs. Gradual tightening of fuel economy and tailpipe CO2 standards has augmented the role of EVs to meet these new standards. Today, over 85% of car sales worldwide are subject to these standards, and in the European Union these standards are playing a key role in boosting electric car sales- in 2020 there was largest annual increase, reaching 2.1 million EV sales.[1]

To make the 2020s the decade of transition to electric vehicles, it will require more ambitious action. For EVs to unleash their full potential to combat climate change there will need to be mass adoption of electric light-duty vehicles and specific policy support and model expansion for the medium- and heavy-duty vehicle segments will be critical.

This section will dive into policy reconditions that can be made at all levels of government in policy, design, and implementation.

Federal

At the federal level, the United States has generally taken a less supportive approach to EV adoption than other countries. However there has been recent progress in prioritizing widespread electric vehicle deployment.

During the last presidential administration fuel economy standards were made significantly weaker dropping from 4.7% to 1.5% for model years 2021-2026, reaching 32 miles per gallon by 2026. However, on December 20, 2021 the United States recommitted itself to higher fuel emissions standards. The new EPA standards for 2023-2026 model year emissions will increase between 5% and 10% each year, getting to 40 miles per gallon by 2026. The rule was published in the Federal Register by the end of 2021 and went into effect 60 days after.[2]

On November 15, 2021, the $1.2 trillion IIJA was signed into law. The Bipartisan Infrastructure Law includes $550 billion in federal investments to America's infrastructure over the next five years, investing $7.5 billion to build out the electric vehicle charging network to support the White House's commitment to deploying a national network of 500,000 charging stations.[3]

The following are federal policy recommendations to further promote electric vehicles in the United States.

Policy

- Expand the federal tax credit for electric vehicles to include pre-owned and leased EVs. The Tax credit should be renewed for GM and Tesla vehicles (both reached their 200,000-unit sales limit per automaker in 2018).[4] Supporting funding for clean energy vehicle tax credits is important to lowering the cost of EVs and make them more attainable for middle- and low-income consumers. Current IRS tax credit can be found here: https://www.irs.gov/businesses/irc-30d-new-qualified-plug-in-electric-drive-motor-vehicle-credit .

- Implement differentiated taxation of vehicles and fuels, based on their environmental performance. Taxing gasoline and diesel at rates that reflects their environmental and human health impacts can provide government revenue that will support the transition to all electric.[5] A differential taxation policy on vehicles and fuel types would need to be done in a thoughtful manor to prevent disproportionately affecting lowering income individuals who may to be able to make the switch to more fuel-efficient vehicles.

- Make a federal pledge for a full phase out of ICE vehicles in the United States. An example of countries who have made these pledges include Canada, the UK, Iceland, Denmark, Sweden, Norway, Slovenia, Germany, Italy, France, Belgium, the Netherlands, Cape Verde, Costa Rica, and the 13 U.S. states that follow California Low Emissions Vehicles regulations.[6]

- Make a net-zero pledge and formal net-zero action. Denmark, France, Hungary, New Zealand, Sweden, and the UK all have passed their carbon neutral targets into law.[7]

- Close loopholes and encourage automakers to produce alternative fuel vehicles. Current loopholes allow vehicle manufacturers to keep producing ICE vehicles. Automakers get maximum credits for producing minimal numbers of electric vehicles and incorporating other technologies, most of which do not improve emissions. These loopholes allow companies to make more ICE vehicles if they add technologies like car-roof solar panels and high efficiency headlights, even though many of these changes do not significantly improve emissions.[8]

New York State

New York is one of the 13 states to follow the California Low Emissions Vehicles (LEV) pollutant and GHG emissions regulations.[9] LEV standards impose fleet-wide criteria pollutant and GHG-emissions standards for light-duty vehicles. In 2012 LEV III was adopted to include more stringent emission standards for both criteria pollutants and greenhouse gases for new passenger vehicles including gradually stricter requirements being phased in from 2015 to 2025. LEV III also included the adoption of an updated ZEV program which was designed to help states achieve emissions goals by requiring a certain percentage of vehicle fleets use the cleanest available technologies (battery electric, fuel cell, and plug-in hybrid).[10]

Continuing to follow California's lead Governor Hochul signed legislation in September 2021 that would effectively ban sales of new, internal combustion engine cars and trucks in the state by 2035. The legislation also requires new heavy- and medium-duty trucks for sale in New York to be in the zero-emissions category by 2045.[11]

The following recommendations will capitalize on the progress already being made to support the Climate Act goals of reducing greenhouse gas emissions by 85% by 2050.

Policy

- Adopt a low carbon fuel standard similar to the regulation passed in California in 2009. This standard is designed to decrease the carbon intensity of transportation fuel pool and provide an increasing range of low-carbon and renewable alternatives, which reduce petroleum dependency and achieve air quality benefits. The low carbon fuel standard has been especially supportive of heavy-duty electric vehicle adoption.[12] https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard
  In February 2019 Assembly Bill 5262 was advanced to establish a low carbon fuel standard in New York. The bill did not make it out of committee during the 2020 legislative session.[13]

- Adopt an Advanced Clean Trucks regulation similar to that in California. This regulation is a manufacturers zero emission vehicles sales requirement and a one-time reporting requirement for large entities and fleets.[14] https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks

- Reestablish funds for the Charge Ready NY program that were exhausted in October 2021. Charge Ready NY offers public and private organizations that install Level 2 EV charging stations at public parking facilities, workplaces, and multifamily apartment buildings rebates of $4,000 per charging port they install.[15] This program was successful at supporting municipalities install public charging stations in communities across the state, especially in the Genesee Finger Lakes region. https://www.nyserda.ny.gov/charge-ready-ny

Implementation

- Adopt zero-emission commercial vehicles zones similar to that adopted in the Netherlands in November 2021. The zero-emission commercial vehicles zones were created to reduce and cut exhaust fumes from commercial vans within Netherland's cities. Grants and subsidies will be available to help entrepreneurs switch to clean delivery vans or delivery vehicles and create a network of charging satiations to support having the zones up and running by 2025.[16] A zero-emission commercial zone policy is best suited for state or local level implementation within New York State.

Figure 4.1

- Implement a charging station network programthat highlights petroleum reduction and sustainable transportation solutions along specific travel corridors. Corridors could include I-90, the Great Lakes Seaway Trail, or Scenic Route 90. A charging station network program can include suggested EV itineraries, EV roadside aid, free or discounted charging at partner locations, or ways to get involved in EV initiatives. These programs would primarily cater towards EV owners and connect tourists to car rental agencies that have EVs.

- The Oregon Wine Country EV Byway was created in 2014 as a way to connect businesses in the wine industry in the Willamette Valley that have EV infrastructure with the mission to encouraging more sustainable modes of travel for customers. Each year the Oregon Wine Country EV Byway hosts a Plug and Pinot event.[17]

Figure 4.2

Peaks to Parries EV Charging Network Canada is a community driven effort to support EV travel in Southern Alberta. The project will install 20 DCFC/ Level 2 stations through out the region as well as engage in a broad outreach and education campaign to increase EV adoptions, address GHG emissions in the transportation sector and ease regional travel by EVs. Peaks To Prairies is supporting the renewable energy sector in the region by powering the stations with 100% renewable energy through renewable energy certificates sourced from southern Alberta projects.[18]

Both the Oregon Wine Country EV Byway and the Peaks to Parries program seek to support network connectivity, but also to maximize potential economic benefits in their regions. Stations are located so drivers can easily access local amenities and attractions.

- Implement a statewide and state funded electrical training program that aims at preparing workers and businesses for the roll out of electric vehicles. Trainings can be offered in partnership with local community colleges, EV and EVSE manufacturers and maintenance technicians, battery storage manufacturers and utility companies. State funding should include support for workforce partners that provide trainings, unions to enhance their current training offerings, community colleges, as well as business for them to do their own in house trainings for their staff.

Local Governments

Convenient and affordable publicly accessible EVSE will be increasingly important as EVs scale up. Local governments can take a lead role in promoting EV infrastructure investments through building and parking ordinances, streamlined permitting, utility partnerships, and public access initiatives. This section supplies a list of opportunities for local government action on charging access and electric vehicles.

Policy

- Parking enforcement rules can also be amended to discourage the use of EV designated parking spaces by drivers of gasoline and diesel fueled vehicles. Public parking facilities can offer free or discounted parking for electric vehicles. The City of Cincinnati, OH, offers free parking for all electric vehicles. The Cities of Redmond, WA and San Diego, CA have adopted regulations governing the use of EV designated parking spaces.[19]

- Simplifying the EVSE permit process for installation will streamline filing, application approvals and inspections to make EVSE installation faster, easier and more affordable to homeowners and businesses. A task force can be assembled to examine potential roadblocks that may exist in the permitting process and make recommendations on improvements to expedite the process. Municipalities can work with their local electric utility to ensure a seamless process from installation to operation at public and private locations.[20] San Jose and Loma Linda, California both have adopted streamlined EC charging infrastructure ordinances.

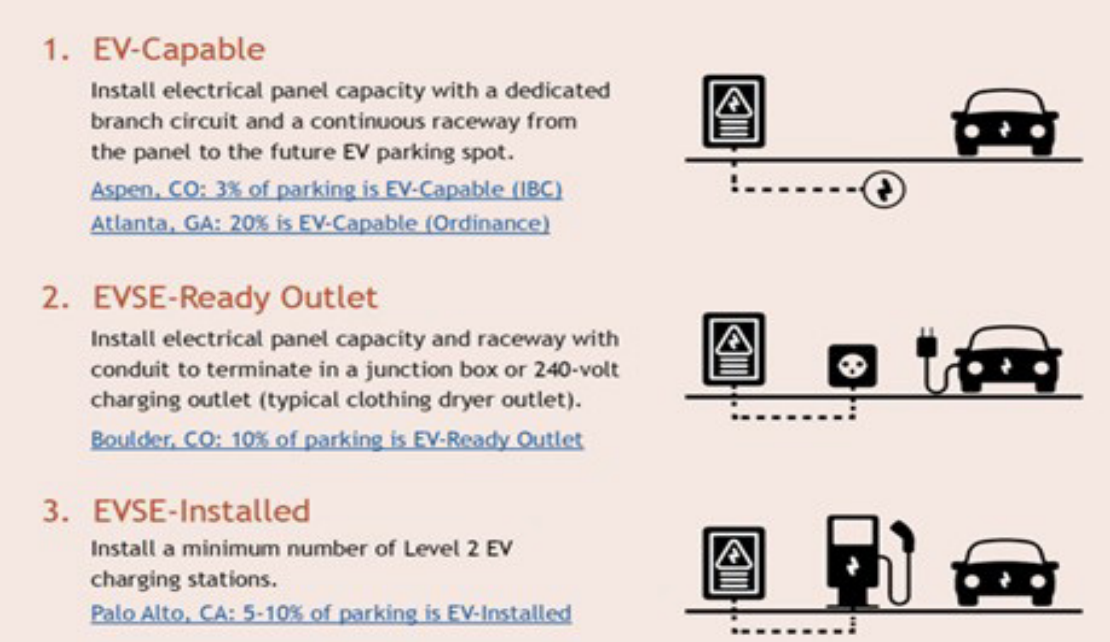

Figure 4.3: Updates to local building codes can make your building EV ready

- Updates to local building codes requiring all new public building and apartment building construction and new parking lots to be EV-Capable, EVSE-Ready or have EVSE-installed as shown in Figure 4.3. This will ensure that new projects are equipped to handle the installation and operation of EV charging infrastructure.

- Update local zoning to define EVSE and determine where and how EVSE is allowed, incentivized, or required. Zoning ordinances could define priority areas where EVSE may be required and where businesses and developers would be incentive to do so. The nature of the incentive would be outlined in the zoning ordinance.
  - -Allow: Define EV, EVSE and charging stations in local planning and land use contexts and list EV charging stations in Zoning Use Tables. Review zoning ordinances to ensure EV charging stations are permitted in logical locations.
  - -Incentivize: EV charging station pre-wiring or installation in exchange for a developer incentive (fewer required parking spaces, or density bonus, open space).[21]
  - -Require: Restrict, allow, or require EV charging infrastructure based on zoning districts, and establish minimum number and type of EV charging stations. [22]

Stations should be located so drivers can easily access local amenities and attractions as conveniently as possible will be increasingly important as EVs scale up.

Design

- Charing stations should be located in convenient and easy to find locations. Charing stations should be in clusters within a downtown core, retail spaces like malls and grocery stores, hotels, workplaces, community centers and libraries, colleges, regional transit hubs, medical centers, multi-family housing and parks.[23]

- Municipalities and developers should look for cost-effective sites that increase value to EV drivers and provide preferential parking to EV drivers. The following locations are ideal for EVSE:
  - Dwell times between two to four hours
  - "Green" image value to host/community
  - 240 volt power near parking spaces
  - Easy to find along major roadways
  - Easily accessible and open 24 hours
  - Lighting at night
  - Larger parking lots with excess spaces
  - Protected from harsh environmental conditions
  - Close Proximity to food and restrooms

- Utilize streetlight EVSE or curbside equipment in neighborhoods where residents rely predominantly on street parking, or in downtowns with on street parking. Melrose, Massachusetts, is currently utilizing streetlight EVSE, and in the Bronx, New York has the first curbside parking charging station as part of a pilot program as shown in figures 4.4 and 4.5.

- Signage is an important tool to inform EV drivers of the location, availability, applicable fees, and provide information about charging station and parking regulations.[24] The DOE has a great resource on signage for changing stations which can be found here: https://afdc.energy.gov/fuels/electricity_charging_station_signage.html

Figure 4.4: Streetlight EVSE in Melrose, Massachusetts

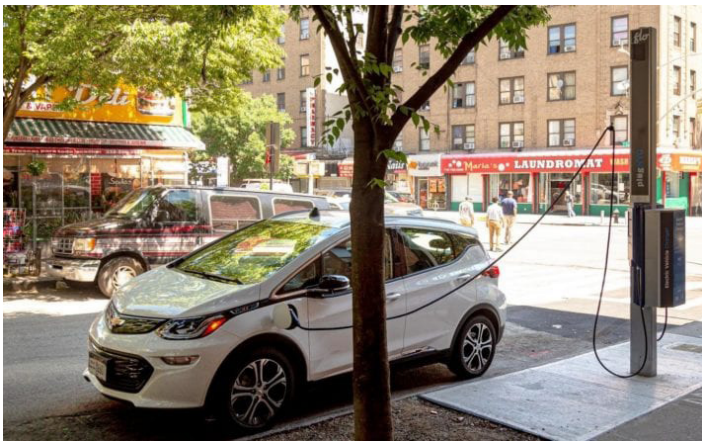

Figure 4.5: Curbside EVSE in the Bronx, New York

Figure 4.6 EV Charging Station Sign

Implementation

- Education is one of the most important steps in advancing access to electrification. Education initiatives, from town halls to social media campaigns, will look different in every community and will need to include policy makers, utilities, residents, and business owners to provide the tools and resources necessary to advance fleet electrification.

- Increase public awareness of EVs and charging opportunities through local marketing programs. These programs will help combat range anxiety and will draw attention to the growing network of publicly accessible chargers and the increasing capabilities and decreasing cost of EVs. PlugNYC is the brand for the NYC DOT's charging infrastructure program, will promote city charging opportunities, off-peak charging, and information about EVs to the public through physical and digital communications.[25]

- Municipalities should map publicly accessible charging stations to allow EV drivers to easily identify the location, availability, fees (if applicable) and type of chargers. Maps should also include points of interest such as coffee shops, restaurants, and shops as well as in a community where people can visit while they are waiting for their vehicle to charge.[26]

- Municipalities can partner with local transit agencies to develop non-fossil fuel last mile solutions using electric vehicles, e-bikes, e-scooters and other modes of transport.

- Utilize site host agreements and public-private partnerships. Site hosts not only can initiate EVSE planning and installation; they can also be key partners for other entities looking to install and operate EV charging stations. Benefits of using a public-private partnership project delivery method can include leveraging private funding or financing for a project, accelerating project delivery, and minimizing risk for a public agency.[27]

- Municipalities should consider joining the Climate Mayors. The Climate Mayors is a bipartisan, peer-to-peer network of more than 470 U.S. cities. As a member of Climate Mayors communities have access to an EV Purchasing Collaborative and leasing support services. This collaborative allows communities to leverage their collective buying power and accelerate the conversion of municipal fleets to electric. The Collaborative also provides training, best practices, educational resources and analysis support, creating a one-stop shop to support EV transitions for public fleet.[28]
  Both Rochester and Brighton are members of communities, and the City of Binghamton utilized the EV Purchasing Collaborative to purchase EVs in 2019.

- Municipalities can consider leasing electric fleet vehicles instead of purchasing them to support. zero-emission, sustainability, and budget goals. Leasing vehicles allows a municipality to upgrade their vehicles more quickly and can take advantage of newer models with vehicle innovations and upgrades with limited risk as an early adopter. Many public entities are currently facing severe budget shortfalls due to the COVID-19 pandemic but they still need vehicles to maintain routine operations. Financial savings can be achieved through leasing:
  -When a vehicle needs to be procured quickly and budget is not available, a lease can be structured to delay payments for up to a year.
  -Leasing can allow public entities to achieve savings from federal tax credits that they otherwise would not have the tax burden for. Private leasing entities retains ownership of the vehicle for the length of the lease term they are able to apply for the federal electric vehicle

tax credit. The leasing entity then passes on a majority of those savings through in the lease term. This structure can also be applied to electric vehicle charging station equipment tax credits, allowing fleets to achieve significant cost savings on both the vehicle and fueling infrastructure.[29]

Leased fleets can reduce their administrative burden by leasing through cooperative procurement contracts. Winter Park, Florida, Des Moines, Iowa and Jersey City, New Jersey all have leased fleet vehicles utilizing The Climate Mayors, the Electrification Coalition, and Sourcewell's cooperative purchasing mechanism. For more information: Saving Money with Electric Vehicle Leasing [PDF]

- Utilize distributed generation and software to balance the electrical grid. Using distributed energy resources like on-site solar and storage to cover extra electricity needs from EV charging is becoming increasingly popular among electric fleet operators of all vehicle types. Electric fleet management software can provide real-time control of EV charging, distributed generation integration, site load management and demand response functionalities. Utilizing these tools will be especially useful for fleets with medium to heavy duty electric vehicles as part of their fleet.[30]

- Good utility rate design and guidance by utility regulators can reduce the excess costs of charging embedded into certain utility rates, especially for DCFC. With thousands of different utilities in the United States, all offering different tariffs to their customers, it is an extremely complex cost for fleet managers to operate.[31] Reach out to your utility to determine the rate structures that are available that will support well managed EV charging. By charging vehicles during off-peak periods (night and early morning hours) overall energy costs will be reduced as shown in Figure 4.7 .[32] Charging management prevents the fleet from charging at high-cost times and shifts charging to lower-cost times. Fleet managers can save 30-50% annually by charging during cost effective times.[33]

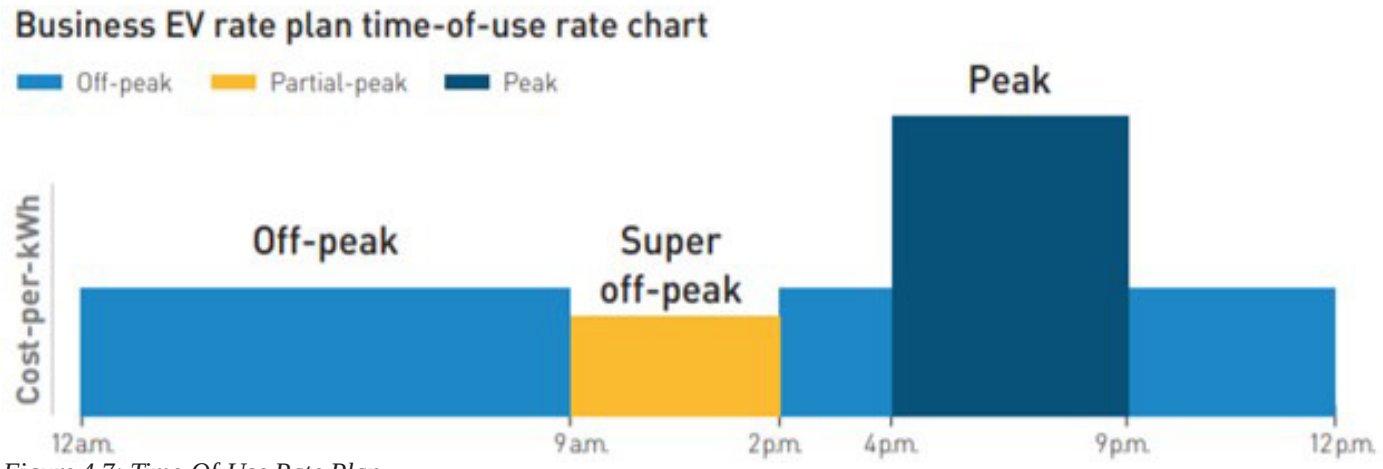

Figure 4.7: Time-Of-Use Rate Plan

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Figures:

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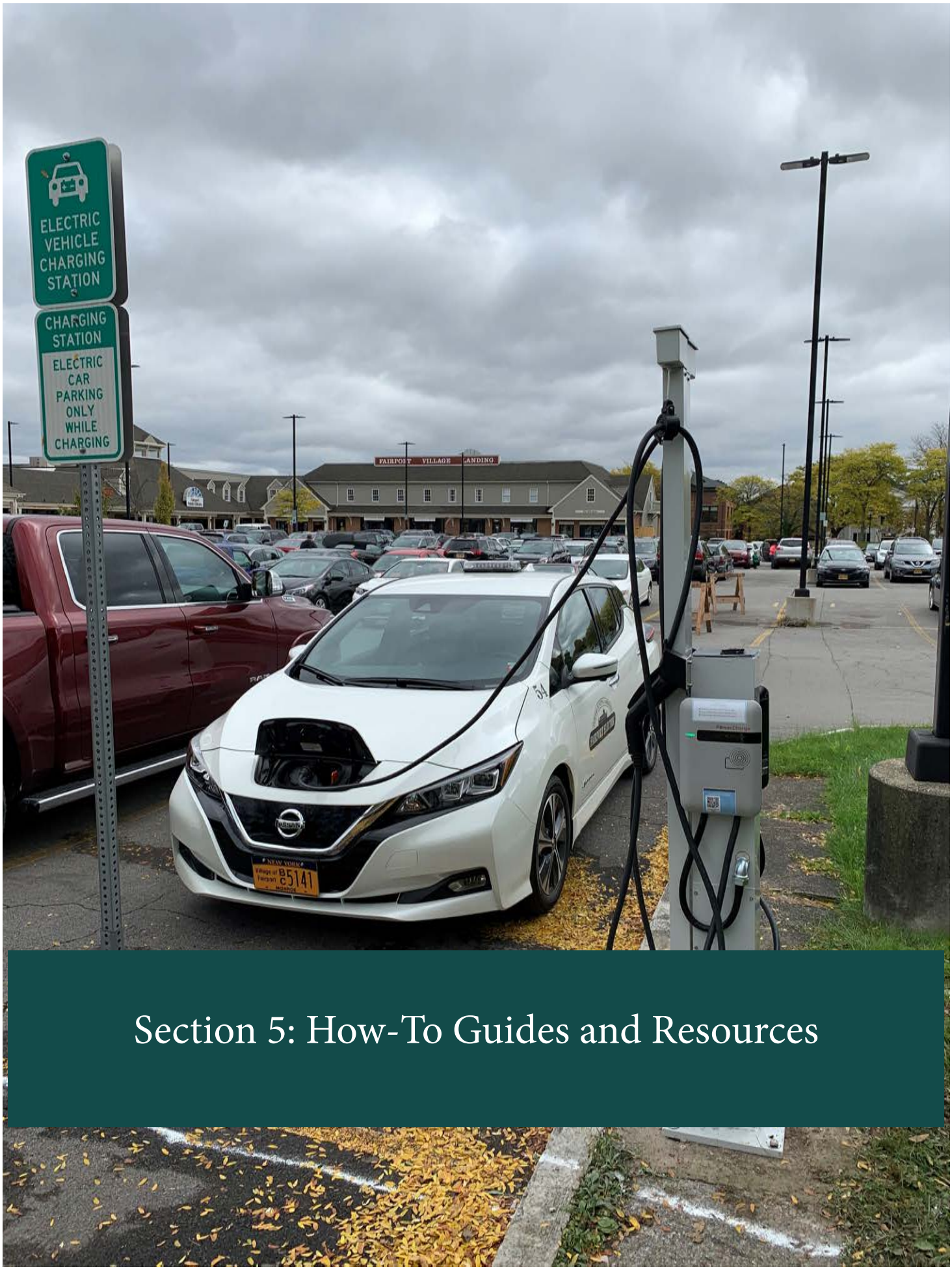


Section 5: How-To Guides and Resources

Figure 5.1: Steps to Fleet Electrification

5. How-To Guides and Resources

To support municipalities and organizations as they consider the transition to electric vehicles the following guides will provide details on what to do first and important resources to utilize. The first is a step-by-step guide on how to turn your fleet electric and the second is a resource guide that has information and links to available funding sources, available electric vehicles, purchasing and procurement, best practices in designing spaces for EV deployment, and training programs.

Steps to Turn Your Fleet Electric

The fleet electrification process includes the phasing in EVs into the fleet owned or leased by an organization, business, or government agency while phasing out traditional gas-powered vehicles. This process requires fleet managers to consider the goals, structures, and the policies in place to have a successful conversion to an electric fleet.

Step 1: Define

The first step for any organization; local governments, school districts, or businesses; is to understand why they want to make the switch to EVs and to define fleet requirements to determine capacity and operational needs. During this step organizations should make a public commitment to fleet electrification. This can happen through a resolution, statement of support, or the adoption of a law directing a transition to an all-electric municipal fleet by a certain date.

Answering the following four questions below will provide the information needed to create a fleet plan that meets current and future capacity needs.

Question 1: What are the reasons for switching to EVs?
Organization, business, and government agencies will transition to EVs for a variety of reasons. Whether the reason is environmental or corporate responsibility, government mandated, for the cost savings, or to take advantage of incentives programs determine what makes the most sense for your organization.

Question 2: Is switching to EVs going to be operationally and financially viable?
Operational and maintenance cost savings are the two of the biggest determinants of EV return on investment. Assess how much money your fleet is currently spending on gas and maintenance. While electric vehicles do not use fuel and maintenance costs tend to be cheaper you will see an increase in electric use.

Evaluate the cost of the total EV investment including but not limited to vehicle procurement, construction costs for new or upgraded infrastructure and training costs compared to the savings on operation and maintenance. This evaluation will determine the speed at which your fleet moves to fully electric.

Question 3: Do all fleet vehicles need to be fully electric?
Fleet managers need a clear understanding of how their current vehicles are used, how far they travel, and under what conditions before introducing electric vehicles. Fleet analysis must focus on individual vehicles to find the right vehicle for the job.

For vehicles that drive less than 100 miles per day and can plug in at night, an EV might be suitable. A municipal vehicle used by the mayor, council member, code enforcement, or parks department would typically be driven less than 100 miles a day and would charge at night making it a great vehicle to switch to electric. Medium-duty EVs are ideal for fleets with fixed daily routes such as shuttle buses, delivery trucks, and school buses.

On the market today there are many fully electric or plug in electric sedans, pickup trucks, and medium duty vehicles that are excellent internal combustion engine equivalents. If your fleet includes heavy-duty vehicles such as plows, refuse vehicles, street sweepers or other maintenance and construction equipment there are currently not as many EV equivalent vehicles on the market, but the technology is improving daily. The DOE has a "find and compare cars" resource which allows you to compare vehicles of all fuel types, which can be found at: https://www.fueleconomy.gov/feg/findacar.shtml

Question 4: What new maintenance, vehicle cycle mechanisms and training need to be added to fleet operations?
As with any new technology, formal training upon the initial and any subsequent vehicle deployments will help ensure project success. Vehicle support starts with proper vehicle maintenance training at the start of each deployment.

EVs have fewer mechanical parts, which means that there are less components to go wrong with them. This is good news for maintenance scheduling and will reduce downtime. However, as with combustion engine vehicles, they do require an annual service and inspection which needs to be factored into the life cycle costs. Organizations, businesses, and municipalities need to offer training to support the maintenance of EVs or partner with local dealerships and mechanics. Communication and education are key when introducing electric vehicles especially to the users of the vehicles. It critical that municipal or organizational staff, management, council and/or board members are informed and excited about making the switch to EVs, especially those who will be driving the new vehicles.

Step 2: Select Technologies

Next fleet managers will review and select vehicles for their fleet based off the operational needs of the organization. This will determine the type of vehicles needed to successfully replace the current ICE fleet and prioritize which vehicles to switch out first. The selected EVs will also help determine the scope of the charging network such as the charging connectors, charging speeds and networking capabilities that will be necessary to meet demand. Asses how much it will cost to buy electric vehicles and the charging equipment and identify key funding opportunities at the state and federal level.

When choosing charging infrastructure, ensure that the manufacturer has complied with certification requirements, including testing the product with a certified testing body. Charging infrastructure should also be compliant with SAE International standards. Also, check for other optional certifications that may be of interest, such as the U.S. Environmental Protection Agency's ENERGY STAR® program.[1]

Step 3: Vehicle and Equipment Procurement

There are several fleet procurements models to consider as a municipality. Below is an outline of four of the most common fleet procurement models. More information can be found in NYSERDA's EV Procurement Review for Public Fleets [PDF].

- On-going Purchase Contracts- This is the most common model of public EV procurement to purchase vehicles from in-State dealers via an existing contract. The process of establishing a contract with a dealer begins when the applicable state office announces a public solicitation for bids. A single dealer is typically selected for each vehicle model available on state contract. These exclusive contracts are in effect for a set period typically 24 to 36 months. Once the contract has been awarded users (authorized purchasers in state agencies or municipalities) can purchase vehicles through the contract. Purchases are usually allowed on an on-going basis.[2]

- Aggregate Procurement (or collaborative procurement)- This is process where multiple entities combine their EV procurements into a single process or bid request.[3]

- Closed-End Leasing- In a closed-end lease, the lease term and monthly payments are fixed. The lessor sets restrictions on mileage and wear, and maintenance and repairs are typically built into the lease contract. At the end of the term, the lessee is under no obligation to make additional payments, provided the vehicle didn't exceed the maximum mileage or other terms. The lessor then assumes responsibility for the vehicle.[4]

- EVs as a Service- This is a newer comprehensive service model for EV deployment. This model is a lease of EVs to public fleets, and the model incorporates other elements of vehicle operations (charging station deployment, telematics, fueling costs) into a single price and service contract. The idea is to provide a turnkey way for public fleets to adopt EVs for a fixed or predictable price.[5]

A formal solicitation process may be needed to purchase and install charging infrastructure. If a formal RFP or RFQ is required, the following should be considered and included in the solicitation process[6]:

- Technical Support and Maintenance- You may specify how your organization prefers technical and maintenance issues to be resolved and who will be responsible for them.

- Networked Stations- If your organization wishes to monitor data usage, prefers online updates, or plans to require payment, you may ask suppliers to detail the options available for accessing data and energy monitoring information.

- Power Fluctuations and Metering- You may request that a supplier address how its EVSE units can adjust to varying power supply and you may consider how the EVSE units monitor and report their power usage.

- Warranty- You may specify the desired length of the warranty, and what the warranty would cover. Warranty needs should be considered for the hardware, as well as the electrical, foundation, and restoration work.

Step 4: Site Review, Design and Planning

Aside from the actual cost of the EV charging equipment, typical installation costs include trenching for electrical conduit, upgrades to electrical service panels and potential upgrades to the local electrical distribution grid. Careful consideration of the installation site of charging stations is crucial to an EV fleet success and will control schedule and costs.

Infrastructure costs can be reduced by identifying where on your property is the shortest distance to an interconnection point with available electric capacity. It is important to consider entry, park and exit pathways, as well as the vertical surfaces, protected areas and locations of existing electrical equipment. Walls, light posts, and other vertical structures may serve as EVSE mounting locations if adjacent parking space is available and vertical surfaces can support overhead charging equipment. Using existing surfaces can reduce capital costs by eliminating the need for a dedicated EVSE post and in-ground wiring. Figure 5.2 below is an example layout of EVSE for fleet purposes.

It is good practice to engage with your utility early in the design process. Managers, and utilities must work together to develop power delivery road maps that integrate utility programs and charging rates, and calculate savings based on future charging loads. Stakeholders should plan for long-term power capacity.

This step is a suitable time to determine additional site needs such as signage and security.

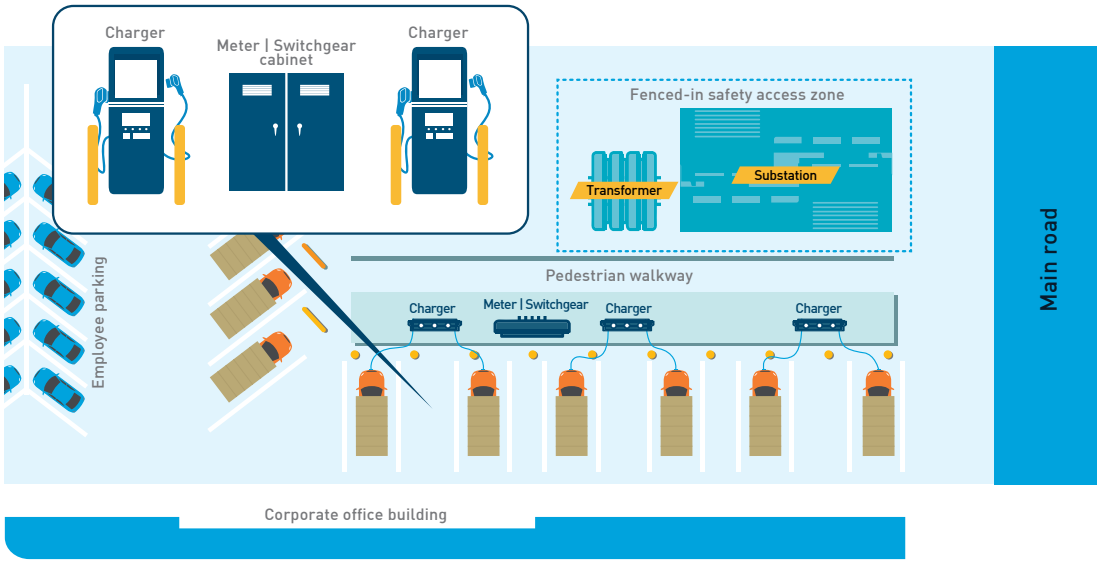


Figure 5.2: Electrical Equipment Layout Example

Step 5: Apply for Permits and Approvals

Charging station installations must comply with local, state, and national codes and regulations, and be completed by a licensed electrical contractor. To find licensed electrical contractors trained in charging station installation, consult with charging station manufacturers, utilities, the Greater Rochester Clean Cities or you can utilize the New York State approved contractors list: https://jointutilitiesofny.org/ev/make-ready/approved-contractors

An electrical contractor should be aware of the relevant codes and standards and obtain a permit from the local building authorities before installing EVSE.

Step 6: Construction & Installations

Once all the approvals and permits are in place, site construction can begin. This includes installing EVSE charging equipment and construction of electrical infrastructure from electrical panel to EVSE. Once full power has been delivered, commissioning and testing can begin.

Step 7: Monitor Vehicle and EVSE Performance

Once EVs are brought into the fleet and EVSE is deployed it is imperative that fleet operators monitor the vehicle and equipment performance similar to the ICE counterparts within the fleet.[7]

- Vehicle Data- Monitor and analyze the real-world range you're achieving compared to the manufacture's range prediction.
- Charging Data- Evaluate charging behaviors to determine best practices, monitor individual vehicle charge levels and their capacity to finish assigned work.
- Route and Schedule Data-Analyze charge levels throughout a specific route to better understand the vehicle's true battery-life.
- Uncontrollable Factor Data- There are many factors that impact range that simply cannot be controlled such as climate. By monitoring these conditions over time, certain conclusions can be made regarding the state of charge to help you more accurately predict range during certain times of the year and during certain times of the day.
- Driver Behavior Data- Certain driver behaviors such as harsh acceleration and breaking actions can impact battery life. Use driver behavior data to assign drivers according to how they tend to behave or to retrain them promoting practices for conserving battery life.

Available Resources

This guide will provide details on funding, purchasing and procurement of EVs and EVSE, available vehicles, utility information and available training programs Each section includes links to valuable resources that can be used for researching and ultimately making the switch to electric vehicle fleets and installing charging stations.

Federal Funding Sources

- Congestion Mitigation and Air Quality Improvement Program (CMAQ): The CMAQ program provides a flexible funding source to State and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Eligible activities including light-duty vehicle charging, commercial charging, public transportation charging, workforce development, and vehicle acquisition. For more information about the Federal Highway Administration (FHWA) program visit: https://www.fhwa.dot.gov/environment/air_quality/cmaq/

- Community Facilities Grant Program: Provides funding to develop essential community facilities in rural areas. Funds from the program can be used to purchase, construct, or improve essential community facilities, which includes various EV infrastructure. For more information about this grant opportunity offered by the U.S. Department of Agriculture (USDA) visit: https://www.rd.usda.gov/programs-services/community-facilities/community-facilities-direct-loan-grant-program

New York State Funding Sources

- New York Truck Voucher Incentive Program: This NYSERDA program supports the replacement of old diesel-powered trucks by providing fleet operators with vouchers that cover the difference in cost between an alternative fuel truck and a comparable diesel truck. More information is available on the program website at: https://www.nyserda.ny.gov/All-Programs/Truck-Voucher-Program

- The Drive Clean Rebate for Plug-in Hybrid Electric Cars: Point-of-sale (at the dealership) rebate program managed by NYSERDA. The initiative aims to encourage the growth of clean and non-polluting electric car use in New York State and reduce carbon emissions in the transportation sector. The Drive Clean Rebate is available to New York State residents, businesses, and government entities who buy or lease new eligible cars through participating new car dealerships. More information is available on the program website at: https://www.nyserda.ny.gov/drive-clean-rebate

- Municipal Zero-emission Vehicle (ZEV) Program: A DEC program that provides rebates to cities, towns, villages, and counties to purchase or lease (for at least 36 months,) eligible new zero-emission vehicles for fleet use. Opportunities for funding in 2021 closed on October 29, 2021; however, additional funding opportunities are anticipated for the future. For more information visit: https://www.dec.ny.gov/energy/109181.html

- Charge Ready NY: This NYSERDA program offered rebates to public and private organizations that install Level 2 EV charging stations at public parking facilities, workplaces, and multifamily apartment buildings. This opportunity closed in 2021 and no additional funding is currently available; however, in the event that additional funding is applied to this program in the future, information is available here: https://www.nyserda.ny.gov/charge-ready-ny

- New York Joint Utility Make Ready Program: This New York Public Service Commission program is available to National Grid, Rochester Gas and Electric, and NYSEG utility customers. This program covers up to 100% of the electric infrastructure installation costs associated with public, non-residential EV Level 2 and DCFC charging stations. More information about this program is available here: https://www.nyseg.com/wps/portal/nyseg/saveenergy/electricvehicles/ev-charger-make-ready-program/

The following resources can help local governments find local, State, and utility funding and financing programs for EV infrastructure projects. They contain filterable lists funding programs, contact information for a regional agent who can identify relevant funding and financing programs, or both.

- Alternative Fuels Data Center (AFDC): The AFDC Laws & Incentives page contains a filterable search tool that provides lists of programs and regulations from DOE and State governments AFDC also has a State Laws and Incentives interactive map that can further help entities find region-specific resources. https://afdc.energy.gov/laws/state_summary?state=NY

- Clean Cities Coalitions: The Greater Rochester Clean Cities Collation is an important partner for conceptualizing potential projects as well as identifying stakeholders, funding programs, and resources for EVSE projects in a specific region. https://grcc.us/

- Database of State Incentives for Renewables and Efficiency (DSIRE): DSIRE is a comprehensive source of information on incentives and policies that support renewable energy and energy efficiency in the United States. Users can select their State in the database to find incentives and funding opportunities. https://www.dsireusa.org/

Available Electric Vehicles

- The DOE keeps an online resource which allows you to compare vehicles by miles per gallon (MPG) or miles per gallon equivalent (MPGe), annual fueling costs, technical specs as well as the MSRP. See https://www.fueleconomy.gov/feg/findacar.shtml for more information.

- Commercial sites where consumers can search for the top electric and hybrid vehicles of 2021 and 2022 include:
  -Kelley Blue Book: https://www.kbb.com/
  -Motor Trend: https://www.motortrend.com/
  -Car and Driver: https://www.caranddriver.com/

Purchasing and Procurement

- There are several fleet procurements models to consider as a municipality which are reviewed in NYSERDA's EV Procurement Review for Public Fleets [PDF].

- Climate Mayors EV Purchasing Collaborative leverages collective buying power to accelerate the conversion of municipal fleets to electric vehicles. The Collaborative also provides training, best practices, educational resources, and analysis support, creating a one-stop shop to support EV transition for public fleets. Procurement of Vehicles provides step by step guidance to using the Climate Mayor collaborative to purchase EVs. For More information on the Climate Mayors procurement process and their offerings visit: https://driveevfleets.org/procurement-process/.

- ZEV and other fuel-efficient vehicles are available on the New York Vehicle Marketplace, a centralized contract managed by the Office of General Services. Any eligible user (public agencies, authorities, local governments, school districts and other eligible non-profits) can use the marketplace to buy a ZEV or fuel-efficient vehicle. For more information about New York's Vehicle Market Place please visit: https://ogs.ny.gov/procurement/vehicle-buyers.

- Aggregate ZEV Purchasing: To make ZEVs more affordable, the New York State Department of Environmental Conservation and the Office of General Services organized an aggregate purchase of ZEVs. The first aggregate purchase lowered the price of a Chevrolet Volt by $4,700. To learn more about upcoming aggregate purchasing opportunities call (518) 457-1744.

- The DOE's Guidance in Procurement of EVSE [PDF] provides a description of the types of requirements to be included in an employer's workplace charging request for proposal. This guidance serves as a reference for an employer to consider when buying EVSE as part of a workplace charging program

Policy and Design

- EV Make-Ready Fleet Assessment Services is a program offered by the Joint Utilities of New York. The Assessment services support fleet managers in the beginning states of considering converting to electric vehicles. Each public utility company in the Genesee Finger Lakes Region participates in this program and will provide an analysis of site feasibility for anticipated load increases and rate analysis to determine appropriate rates and estimated billing impact for increases in energy consumption. This is available to both municipal and private fleet operators. For more information visit: https://jointutilitiesofny.org/ev/make-ready/fleet-assessment.

- NYSERDA's policy and planning best practices for becoming EV-ready [PDF] offer guidance on preparing communities for the benefits of electric vehicles and support residents who make the investment in cleaner cars. These best practices cover zoning ordinances, local permitting practices and building codes, parking regulations, and the importance of involving relevant stakeholders to develop community EV-readiness plans.

- Creating EV Ready Towns and Cities: A Guide to Planning and Policy Tools [PDF] provides guidance for local governments wishing to take action to implement EVSE deployment in their jurisdictions. It provides guidance regarding the steps to create, administer, and amend planning processes, rules, and regulations, and explores the potential for jurisdictions to encourage EV charging station installation and use. Tools to promote EV-friendly zoning regulations, parking ordinances, building codes, permitting practices, and partnership and procurement are also included.

Resources

- The Transportation and Climate Initiative's EV Ready Codes for the Built Environment [PDF] explains how codes relate to charging stations and what code provisions could be incorporated into local code to encourage a basic or advanced level of EV-readiness.

- NYSERDA's Permit Process Streamlining [PDF] report reviews best practices for residential charging station permitting and includes sample permit application forms.

- NYSERDA's DC Fast Charger Streamlined Permitting Guidebook [PDF] for information on charging technology and model permitting rules and forms specific to DCFC chargers.

- While the charging station host handles the siting and design of public charging stations, municipalities should encourage compliance with industry best practices. Examples of these are outlined in NYSERDA's Site Design for Electric Vehicle Charging Stations [PDF], a resource for local governments to share with charging station hosts during the installation planning phase.

- The Transportation and Climate Initiative's Siting and Design Guidelines from EVSE [PDF] identifies key siting and design issues that are relevant to local governments, developers, homeowners, businesses, utility providers, and other organizations. The guidelines provide an overview of elements of site selection and design and installation scenarios, including considerations for commercial lots, multi-family residences, on-street charging, service station models, and fleets.

- Municipalities can encourage the proper use of signage at charging station spaces by reviewing recommendations outlined in NYSERDA's EVSE Signage Overview [PDF].

- NYSERDA's Promoting Electric Vehicle Charging Station Installations [PDF] best practice guide suggests ways that planning boards can encourage developers to include charging stations in their projects.

- Municipalities can also encourage site owners to follow best practices and learn from prior installations documented in case studies compiled by NYSERDA from around New York State. Case studies are available at the bottom of NYSERDA's page here: https://www.nyserda.ny.gov/All-Programs/ChargeNY/Charge-Electric/Best-Practices

- A list of certified EVSE installers in New York State is available here: https://evitp.org/newyork

- New York State approved contractors for Make-Ready funding is available here: https://jointutilitiesofny.org/ev/make-ready/approved-contractors

Training Programs

- Monroe Community College (MCC) Automotive Training Apprenticeship Program: MCC partners with regional General Motors dealerships to provide technical training opportunities for students. During the two-year, five-semester program, students learn about all major automotive systems and will complete 80-100% of the GM training required to becoming a GM certified technician in both the classroom and with on-the-job training. For more information visit: https://www.monroecc.edu/academics/majors-programs/stem/automotive-training-apprenticeship-aas-asep/

- Monroe Community College Mechatronics Certificate Program: The program includes classroom learning and hands-on experience in the operation and maintenance of electro-mechanical-computer controlled systems found in today's automated manufacturing environments. This one-year certificate program represents the first half of MCC's Applied Integrated Technology associate degree; students will have the option to start a career or transfer credits toward the degree program. https://www.monroecc.edu/academics/majors-programs/stem/mechatronics-certificate/

- Monroe Community College's Applied Integrated Technology Associates Degree: This interdisciplinary program prepares students for positions in high technology fields applying mechatronic principles to the operation and maintenance of electro-mechanical-computer controlled systems commonly found in advanced manufacturing environments. The curriculum integrates electrical, mechanical, and computer controls so that students will be prepared to work in the operations, installation, and maintenance of automated and robotically controlled systems and manufacturing technologies. Upon completion of the program graduates will be qualified for the jobs such as industrial maintenance and manufacturing including assembly, testing, startup, troubleshooting, repair, and upgrades of machinery and the associated control systems. https://www.monroecc.edu/academics/majors-programs/stem/applied-integrated-technology-associate-degree/

- The International Brotherhood of Electrical Workers, Local 86: The Rochester-based chapter of the IBEW is accredited to instruct students and administer testing on alternative fuel technologies. The prerequisite is to have 8,000 hours of documented electrical installation experience to become certified and/or a Master electrical license in the jurisdiction in which an IBEW member is preforming work. See the IBEW Local 86 website here for more information: http://ibewlu86.org/

- National Alternative Fuels Training Consortium (NAFTC): The consortium operates through a network of community and technical colleges who have participated in the development of NAFTC curricula or in an NAFTC train-the-trainer program. These schools incorporate NAFTC curricula into their coursework and offer NAFTC training to others on a case-by-case basis. The closest training centers are located Onondaga Community College, NY in Syracuse, and Alfred State College in Alfred, NY. For more information visit: https://naftc.wvu.edu/training-centers/

- Electric Vehicle Infrastructure Training Program (EVITP): A not-for-profit, volunteer, EV industry collaborative training program that addresses the technical requirements, safety imperatives, and performance integrity of industry partners and stakeholders. The training is two phases; the first addresses the requirements, regulations, products, and strategies, to master customer relations, installation, and maintenance of EV and EVSE. The second phase is fleet and commercial training; troubleshoot, wireless energy transfer, fast charging and energy storage. For more information visit: https://evitp.org/

Endnotes:

1. “Charging Infrastructure Procurement and Installation”, Alternative Fuel Data Center, accessed January 5, 2022, https://afdc.energy.gov/fuels/electricity_infrastructure_development.html
2. “EV Procurement Review for Public Fleets” NYSERDA, January 2018, pp. 15 https://acrobat.adobe.com/link/review?uri=urn:aaid:scds:US:619a5d3c-5cdd-405e-8138-d87635dceb68#pageNum=1
3. “ EV Procurement Review” pp 17
4. “ EV Procurement Review”, pp. 20
5. “ EV Procurement Review, pp. 23
6. “Guidance in Procurement of Electric Vehicle Supply Equipment”, U.S. Department of Energy, November 2014, pp.5 , https://afdc.energy.gov/files/u/publication/WPCC_sampleRFP_1114.pdf
7. “Electric Vehicle Monitoring”, Clever Devices, accessed January 5, 2022, https://www.cleverdevices.com/solutions/electric-vehicle-monitoring-solutions/

Figures:

5.1 G/FLRPC
5.2PG&E

Appendices

Appendix A: Abbreviations

- **AC**: Alternative current
- **AFDC**: Alternative Fuels Data Center
- **AFV**: Alternative Fuel vehicle
- **BEV**: Battery electric vehicle
- **BIL**: Bipartisan Infrastructure Act, also referred to as the Infrastructure Investment and Jobs Act (IIJA)
- **BTCC**: New York Battery and Energy Storage Consortium Test and Commercialization Center
- **BTM**: Behind the meter
- **CLCPA**: Climate Leadership and Protection Act, also referred to as the Climate Act
- **CMAQ**: Congestion Mitigation and Air Quality Improvement
- **DCFC**: Direct current fast charge, usually stated as DC fast charger or Level 3 charger.
- **DOE**: Department of Energy
- **DOL**: Department of Labor
- **DOT**: Department of Transportation
- **EIA**: U.S. Energy Information Administration
- **EV**: Electric vehicle
- **EVITP**: Electric Vehicle Infrastructure Training Program
- **EVSE**: Electric vehicle supply equipment
- **FHWA**: U.S. Federal Highway Administration
- **FTA**: U.S. Federal Transit Administration
- **GHG**: Greenhouse gas
- **HEV**: hybrid electric vehicle
- **HUD**: U.S. Housing and Urban Development
- **IBEW**: International Brotherhood of Electrical Workers
- **ICE**: Internal combustion engine vehicle
- **LEV**: Low emission vehicles
- **NEVI**: National Electric Vehicle Infrastructure formula grant
- **NY-BEST**: New York Battery and Energy Storage Consortium
- **NYISO**: New York Independent System Operator
- **NYSERDA**: New York State Energy Research and Development Authority
- **PEG**: Plug-in Electric Vehicle
- **PHEV**: Plug-in-Hybrid Electric Vehicle
- **RGRTA**: Rochester Genesee Regional Tranist Authority
- **RTS**: Regional Transit Service
- **USDA**: U.S. Department of Agriculture
- **ZEV**: Zero emission vehicle

Appendix B: Charging Basics

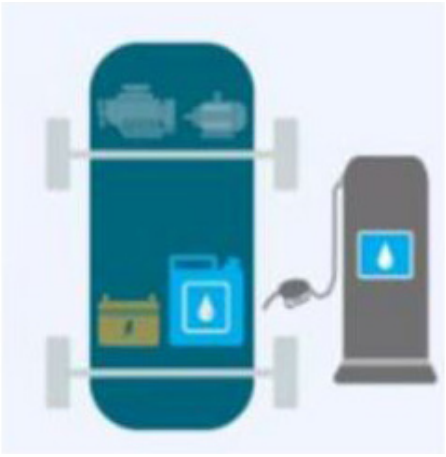
Electric Vehicle Types

There are three types of electric vehicles (EV), the type most people associate with EVs, are Battery Electric Vehicle or BEV. There are also Hybrid Electric Vehicles (HEV) and Plug-in Electric Vehicles (PHEV). Each are explained below

Battery Electric Vehicle- BEV

A Battery Electric Vehicle has no gasoline engine, all the car's energy comes from the battery, which powers an electric motor, and BEVs have zero emissions. The range (or distance you can travel on a charge) varies between models and years, but most BEVs can get anywhere from 75 – 402 miles on a single charge.

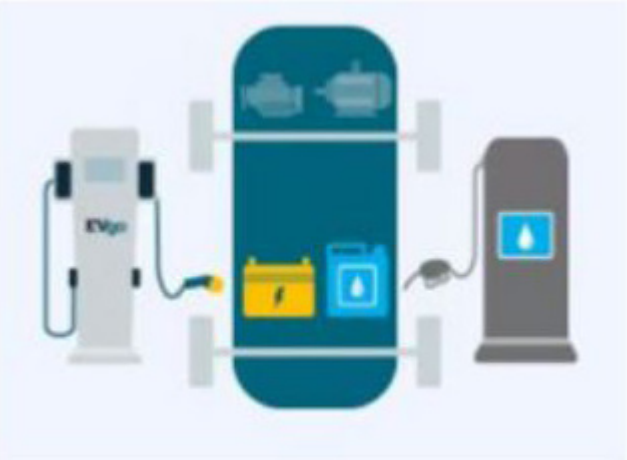
Examples of BEVs include the Tesla Model 3, the Chevy Bolt, and the Nissan LEAF. Different models have different charging ports and different ranges.



Hybrid Electric Vehicle-HEV

For those not quite ready to take the all-electric plunge, there's another type of EV called a Hybrid Electric Vehicle (HEV). HEVs are powered by an internal combustion gasoline engine (ICE). In some HEVs, the ICE both recharges the electric battery and drives the transmission, while in others the ICE only recharges the battery (which drives the electric motor). In both cases, HEVs are gasoline powered cars that emits much lower pollutants than a typical gasoline car. They're excellent for environmentally conscious people, or people looking to save money on gas.

Examples include the Toyota Prius, the Honda Insight, and the Ford Fusion Hybrid. Because HEVs cannot plug in, they will not charge at any public charging station.



Plug-in-Hybrid Electric Vehicle- PHEV

A Plug-in Hybrid Electric Vehicle or PHEV have both a gasoline engine and tank, and they also have a charging port to recharge an electric battery. A typical electric range of a PHEV is about 10-40 miles, which is ideal for commuters who can recharge at home or on-the-go. Once the electric range is depleted, the vehicle reverts to hybrid mode and relies on its gasoline engine.

Examples of PHEVs include the Chevrolet Volt, Toyota Prius Plug-in, and the Kia Optima Plug-in. Unlike HEVs, PHEVs can recharge at AC Level 2 stations, and some can even accept a DC Fast Charge. (Port types and levels of charging will be explained below)

Levels of Charging

There are three primary charging types: Level 1, Level 2, and Level 3 chargers. Each are explained below.

Level 1 Charging

Level 1 charging is the most basic type of charging from a standard 120 volt standard electrical outlet. Level 1 charging is the slowest and is best suited for overnight at home charging. An EV will typically get four to eight miles of range per hour charge and takes approximately 20 hours for a full charge.

Level 2 Charging

Level 2 charging use 208-240 volt electrical circuits (like the same for electric dryers and stove tops). Level 2 charging is much faster, 15-30 miles of range per hour charging: about five to six hours. Level 2 charging is best suited for work and multifamily homes, where vehicles are parked for significant amount of time and charging speed does not matter. Level 2 stations are also found in public places like shopping centers. Level 2 chargers are also great for municipal or private EV fleets.

Level 2 stations offer both networked and non-networked charging. Networked stations transmit data over the internet to the network host allowing for more advanced controls, billing options, and usage analytics. Non-networked stations will have no internet connection and only offer drivers the ability to plug in and charge.

Level 3 Charging

Level 3 charging or Direct Current Fast Charging (DCFC) use ultra high-power 480 volt electrical circuits. DCFC is the fastest way to charge your EV, you can get an 80% charge in about 15-45 minutes. They are best suited for public locations such as retail, hospitality or recreation facilities where there are vehicles parked for a shorter amount of time, or along major travel routes and highways. DCFC charging infrastructure often requires upgrades to a sites electrical service. Level 3 chargers are typically not recommended for fleet vehicles unless there is a specific need for rapid recharging.

Level 3 stations are all networked allowing for more advanced controls, billing options, and usage analytics.

Appendix C: Workforce Readiness Survey

1. Do you believe our regional workforce is currently ready for the shift to all electric fleets and all electric personal vehicles? Why or why not?

2. Do you believe our region's fleet owners/operators and employers are currently ready for the shift to all electric fleets and all electric personal vehicles? Why or why not?

3. What programs already exist in our region that are assisting both regional workers and employers' transition to green technology and EVs?

4. How can the One Stop career centers and partners assist workers entering into green technology manufacturing jobs?

5. How do we make this technological shift to avoid a skill gap and missed manufacturing opportunities?

6. How do we make this technological shift just and equitable?

7. How can the One Stop career centers and partners assist employers in our region as we make this shift?

8. What skills are employers looking for in this field?

9. What training resources need to be developed in order for potential workers to gain the desired skills?

10. Do you believe that there will be challenges due to shrinking populations in this region to achieve the workforce needed for this shift?

11. Our state is already a hub for battery technology with NYBEST and Imperium3 battery centers. These battery networks aligned with the purchasing power of the MTA and the goal to fully electrify RTS by 2035 could position Upstate NY to become a heavy-duty battery manufacturing hub. How do we leverage this opportunity?

12. Anything else you would like to share about workforce challenges and opportunities as the state makes the shift to all electric fleets?

Appendix D: Case Study Interview Questions

Intro

1. Tell us a little about your community/organization and why you decided to electrify your fleet. What were your goals and priorities for electrification?

Implementation

2. Did you engage with any key stakeholders or the community during this process?
3. Describe your EV solution-
   a) How many and what types of EV vehicles did you acquire?
   b) What infrastructure of facility upgrades did you make in order to support the EVs?
4. How did this solution support your community/organizational goals?
5. What was the cost of your EV solution?
   a) Did you utilize any funding sources or tax credits? Which ones?
6. How did you select your equipment and vendors?
   a)Criteria for selection

Training and Maintenance

7. What challenges were there in training your staff in using this new technology? Or suspected challenges? 8.
8. What changes were made in staff training in order to utilize this new technology? Or suspected changes?
9. What challenges were there in your maintenance practices in order to adapt to this new technology? Or suspected challenges?
10. What changes were made to your maintenance practices in order to properly maintain this new technology? Or suspected changes?

Impact

11. What impacts did you see from installing this technology? (both positive and negative)
    a) Fuel cost savings
    b) Maintenance costs savings
    c) Electricity costs
    d) Health impacts
    e) Other

Lessons learned

12. What would you share with a community or organization that was looking to electrify their fleet?
13. What lessons did you learn from this process?

Appendix E: Public Charging Stations in the G-FL Region January 2022

Station Name	Street Address	City	EV Level 2	EV DC Fast
RTS Orleans	225 W Academy St	Albion	2	
Village of Arcade - Municipal Parking Lot	17 Church St	Arcade	2	
Burger King Attica NY	130 Prospect St	Attica	2	
Avon Village Office	102 Genesee St	Avon	2	
Tom Wahl's Inc	283 E Main St	Avon	4	
Peppermint's Restaurant - Tesla	244 E Main St	Avon	3	
Genesee Community College	1 College Rd	Batavia	2	
Amada Tool America Inc	4A Treadeasy Ave	Batavia	3	
Dunkin'	405 W Main St	Batavia	1	
Batavia Downs	8323-8325 Park Rd	Batavia	2	
New York State Veterans Home at Batavia	220 Richmond Ave	Batavia	4	
Village of Bergen - Municipal Parking	18 Buffalo St	Bergen	2	
Hickory Park	51 S Lake Ave	Bergen	2	
Hunt County Vineyards - Tesla	4021 Italy Hill Rd	Branchport	5	
Village Hall Welcome Center	12-40 Water St	Brockport	2	
Village Hall Station	49 State St	Brockport	2	
Coll Brockport Serc Lot V	321 New Campus Dr	Brockport	2	
Coll Brockport Finearts Lot G1	168 Holley St	Brockport	2	
Coll Brockport Hartwell Lot N	75 College St	Brockport	2	
Bristol Harbour Resort	5410 Seneca Point Rd	Canandaigua	1	
Vision Nissan	2409 Rochester Rd	Canandaigua	1	
Evcs1 Canandaigua	105 S Main St	Canandaigua	2	
Pinnacle North	20 North Shore Blvd.	Canandaigua	6	
Holiday Inn Express Canandaigua	330 Eastern Blvd	Canandaigua	3	
Letchworth State Park	1 Letchworth State Park	Castile	2	
Jim Barnard Chevrolet	7101 Buffalo Rd	Churchville	1	
Village Of Churchville	23 E Buffalo St	Churchville	2	
Rochester Regional Health Clifton Springs	2 Coulter Rd	Clifton Springs	2	
Rochester Regional Health Clifton Springs	2 Coulter Rd	Clifton Springs	2	
Rochester Regional Health Clifton Springs	6 Ambulance Dr	Clifton Springs	2	
AA Tech Shipping	124 Columbia St	Clyde	2	
AA Tech Shipping Maintenance	124 Columbia St	Clyde	2	
NYSE Thurway-Exit 48A-Pembroke	8420 Alleghany Rd	Corfu	2	
River Spring Lodge - Tesla	1961 Church Rd	Darien Center	1	
The FLX Winery- Tesla	5090 Highway 14	Dundee	2	
Hoselton Nissan	66 Marsh Rd	East Rochester	1	
Eyer Building	120 W Commercial St	East Rochester	2	
Hoselton Nissan	909 Fairport Rd	East Rochester	2	
Fairport Village Landing	260 Fairport Village Landing	Fairport		2
Fairport Village Landing	100 Fairport Village Landing	Fairport	6	
Broccolo Tree And Lawncare Garden Center	2755 Penfield Rd	Fairport	1	
Fairport Electric	43 Lift Bridge Ln E	Fairport	1	
Fairport North - Main Parking	80 N Main St	Fairport	6	
Packetts Landing	500 Packetts Landing	Fairport	6	
Fairport Junction	9 Liftbridge Ln E	Fairport	6	
Potter Park	53 W Church St	Fairport	2	
Burger King Farmington NY	1238 State Route 332	Farmington	2	
Muni Parkin Lot Village Geneseo	5 Chestnut St	Geneseo	2	
Geneva	83 Seneca Street	Geneva		2
Finger Lakes Welcome Center	35 Lake Front Dr	Geneva	4	
Town Of Geneva	32 White Springs Rd	Geneva	2	
Hobart William Smith	288 Pulteney St	Geneva	2	
JATC LU 840	1401 NY-5	Geneva	2	

Appendix E

Station Name	Street Address	City	EV Level 2	EV DC Fast
City Of Geneva City Hall #1	47 Castle St	Geneva	2	
Hobart William Smith Medbery Lot	311 Pulteney St	Geneva	2	
Hobart William Smith	288 Pulteney St	Geneva	2	
Peppermints Restaurant - Tesla	4870 W Henrietta Rd	Henrietta	3	T
Mendon Public Library	22 North Main Street	Honeoye Falls	2	
Lacroix court apartments	14 Lacroix Ct Dr	Irondequoit	2	
RTS Irondequoit #2	Irondequoit Plaza	Irondequoit	2	
RTS Irondequoit #1	Irondequoit Plaza	Irondequoit	2	
Lakeville United Church Of Christ	5687 Big Tree Rd	Lakeville	4	
NYSE Thruway - NYPA	8700 Vallance Rd	Le Roy		2
Burger King - LeRoy NY	134 W Main St	LeRoy	2	
Village Of Lima	7327 E Main St	Lima	2	
Lima - Town Court	7329 E Main St	Lima	1	
Prette John Public Parking Lot	17 Commercial St	Livonia	2	
Burger King - Medina	11212 Maple Ridge Rd	Medina	2	
Village Of Mt. Morris - Veterans Park	185 Main St	Mt. Morris	4	
Village Of Mt. Morris	11 Main St	Mt. Morris	4	
Colacino Inustr 1	126 Harrison St	Newark	2	
Rocheser Regional Health Newark East	1200 Driving Park Ave	Newark	2	
Ultralife Corp	2000 Technology Pkwy	Newark	2	
Colacino Inustr Colacino 4	126 Harrison St	Newark	2	
Colacino Inustr Colacino 3	126 Harrison Street	Newark	2	
Colacino Inustr Colacino 2	126 Harrison St	Newark	2	
Rocheser Regional Health Newark East 3	1200 Driving Park Ave	Newark	2	
Rocheser Regional Health Newark East 1	1200 Driving Park Ave	Newark	2	
Rocheser Regional Health Newark West 5	1200 Driving Park Ave	Newark	2	
Rocheser Regional Health Newark West 4	1200 Driving Park Ave	Newark	2	
Rocheser Regional Health Newark West 2	1200 Driving Park Ave	Newark	2	
Rocheser Regional Health Newark West 1	1200 Driving Park Ave	Newark	2	
Rocheser Regional Healthnewark East Gw2	1200 Driving Park Ave	Newark	2	
Rocheser Regional Healthnewark West Gw3	1200 Driving Park Ave	Newark	2	
Towne Plaza	4390 Buffalo Rd	North Chili	8	
Town Of Ontario	1850 Ridge Rd	Ontario	1	
Town Of Penfield - Library	1985 Baird Rd	Penfield	1	
Yates County Yates County 1	214 Main St	Penn Yan	2	
La Belle Vie Bed & Breakfast - Tesla	208 Main St	Penn Yan	2	T
Perry Charging Perry Charging	38 S Main St	Perry	2	
24 State Street Spiegel Center	35 Lincoln Ave	Pittsford	2	
24 State Street Pittsford	14 State St	Pittsford	2	
RTS St. John Fisher 1	Fairport Park & Ride State Route 31F	Pittsford	2	
RTS St. John Fisher 2	Fairport Park & Ride State Route 31F	Pittsford	2	
Rochester NY Court St 2	194 Court St	Rochester	2	
SIBLEY SQUARE MORTIMER FL3 Is	83 Mortimer St	Rochester	2	
Rochester NY EAST END GW-2	475 East Ave	Rochester	2	
Rochester NY Court St 1	194 Court St	Rochester	2	
Sibley Sq. Moritmer FL3 Ctr	83 Mortimer St	Rochester	2	
Sibley Sq. Moritmer GW FL3	83 Mortimer St	Rochester	2	
Rochester NY EAST END GW-2	475 East Ave	Rochester	2	
Inn Square GW 2	100-140 S Clinton Ave	Rochester	2	
Inn Square GW 4	100 Clinton Ave S	Rochester	2	
Inn Square GW 1	86 S Clinton Ave	Rochester	2	
Inn Square GW 3	100-140 S Clinton Ave	Rochester	2	
Rochester Ny Publc Market	39 Trinidad St	Rochester	2	

Appendix E

Station Name	Street Address	City	EV Level 2	EV DC Fast
Rochester Optical	1260 Lyell Ave	Rochester	4	
Howard Commons	2368 Lyell Ave	Rochester	8	
Rochester Ny Wash Sq Garage1	111 Woodbury Blvd	Rochester	2	
Strong Museum Strong L1 #4	1 Manhattan Square Dr	Rochester	2	
Rochester Ny Wash Sq Garage1	111 Woodbury Blvd,	Rochester	2	
Strong Museum Strong L1 #5	1 Manhattan Square Dr	Rochester	2	
Strong Museum Strong L1 #1	1 Manhattan Square Dr	Rochester	2	
Strong Museum Strong L1 #2	1 Manhattan Square Dr	Rochester	2	
Strong Museum Strong L1 #3	1 Manhattan Square Dr	Rochester	2	
300 Alexander 300 Alexander	300 Alexander St	Rochester	2	
City Of Rochester - Public Market	280 N Union St	Rochester	2	
Lake Riley Lodge	100 Norris Dr	Rochester	1	
Volvo of Rochester 1	1500 University Ave	Rochester	1	
Genesee Valley Park - Sports Complex	131 Elmwood Ave	Rochester	2	
Rochester Regional Health St. Marys 2	89 Genesee St	Rochester	2	
Rochester Regional Health St. Marys 3	89 Genesee St	Rochester	2	
Rochester Regional Health St. Marys 4	89 Genesee St	Rochester	2	
Rochester Regional Health St. Marys 5	89 Genesee St	Rochester	2	
Rochester Regional Health St. Marys 6	89 Genesee St	Rochester	2	
Rochester NY Port of Roch 1	1000 N River St	Rochester	2	
Charlotte Branch Library	3557 Lake Ave	Rochester	2	
Greece Town Hal Greece North 1	1 Vince Tofany Blvd	Rochester	2	
Rochester NY Port of Roch 2	1000 N River St	Rochester	2	
Greece Town Hal Greece South 2	1 Vince Tofany Blvd	Rochester	2	
Emerson Street - Parking Lot	880 Emerson St	Rochester	4	
High Falls Garage	240 State St	Rochester	2	
Rochester NY Sisters City 1	28 Fitzhugh St N	Rochester	2	
Rochester NY Sisters City 2	10 Fitzhugh St N	Rochester	2	
Rochester NY Roc City Hall 1	30 Church St	Rochester	2	
Rochester Regional Health Riedman 10	100 Kings Hwy S	Rochester	2	
I-Square North Imagine	11 Stranahan Park	Rochester	2	
I-Square Main Lot (East)	400 Bakers Park	Rochester	2	
Rochester Regional Health Riedman 6	100 Kings Hwy S	Rochester	2	
Rochester Regional Health Riedman 2	100 Kings Hwy S	Rochester	1	
Rochester Regional Health Riedman 9	100 Kings Hwy S	Rochester	2	
Rochester Regional Health Riedman 3	100 Kings Hwy S	Rochester	1	
Rochester Regional Health Riedman 8	100 Kings Hwy S	Rochester	2	
Rochester Regional Health Riedman 7	100 Kings Hwy S	Rochester	2	
Rochester Regional Health Riedman 5	100 Kings Hwy S	Rochester	2	
Rochester Regional Health Riedman 4	100 Kings Hwy S	Rochester	1	
Rochester Regional Health Riedman	100 Kings Hwy S	Rochester	2	
Rochester Regional Health Riedman 1	100 Kings Hwy S	Rochester	2	
I-Square South Imagine	11 Stranahan Park	Rochester	2	
I-Square Main Lot (West)	400 Bakers Park	Rochester	2	
Brighton Memorial Library	2300 Elmwood Ave	Rochester	2	
Dino'S Tailor Shop	2400 Monroe Av	Rochester	1	
Clarion Pointe - Rochester	2729 Monroe Ave	Rochester	1	
Country Inn & Suites - Rochester East	2851 Monroe Ave	Rochester	2	
Learys	3256 Monroe Ave	Rochester	1	
Harley School 1	1981 Clover St	Rochester	2	
Harley School 2	1981 Clover St	Rochester	2	
U Of R Hospital Sec D Blue	110 Crittenden Blvd	Rochester	2	
U Of R Helen Wood Hall	255 Crittenden Blvd	Rochester	2	
College Town Garage	655 Elmwood Ave	Rochester	2	
Al Sigl South Ave	1600 South Ave	Rochester	2	
Al Sigl Elmwood	1000 Elmwood Ave	Rochester	2	
Goodman Parking	854 S Clinton Ave	Rochester	10	

Appendix E

Station Name	Street Address	City	EV Level 2	EV DC Fast
Rochester General Hospital	1425 Portland Ave	Rochester	2	
Rochester Regional Health Riedman NG6	1455 East Ridge Road	Rochester	2	
Rochester Regional Health Carter FL NG3	1415 Portland Ave	Rochester	2	
Rochester Regional Health Portland L1	1445 Portland Ave	Rochester	2	
Rochester Regional Health Portland G1	Rochester General Hospital Dr	Rochester	2	
Rochester Regional Health Riedman NG5	1455 East Ridge Road	Rochester	2	
Rochester Regional Health Riedman NG1	1455 East Ridge Road	Rochester	1	
Rochester Regional Health Riedman NG3	1455 East Ridge Road	Rochester	2	
Rochester Regional Health Riedman NG2	1455 East Ridge Road	Rochester	2	
Rochester Regional Health Riedman GW1	1455 East Ridge Road	Rochester	2	
Rochester Regional Health Portland FL 2 NGW2	1415 Portland Ave	Rochester	2	
Rochester Regional Health Portland FL 1 NGW	1415 Portland Ave	Rochester	2	
Rochester Regional Health Portland FL 2 GW1	1415 Portland Ave	Rochester	2	
Rochester Regional Health Portland FL1 GW1	1415 Portland Ave	Rochester	2	
Dorschel Nissan	3817 W Henrietta Rd	Rochester	3	
Rochester Institute Of Technology - Lot T	1 Lomb Memorial Dr	Rochester	6	
Rochester Institute Of Technology - Lot M	1 Lomb Memorial Dr	Rochester	2	
Henrietta Library 1	625 Calkins Rd	Rochester	2	
Spotcowork Henrietta	21 Goodway Drive	Rochester	2	
Garber Roc Shop 02	3925 W Henrietta Rd	Rochester	1	
IBEW LU86	2300 E River Rd	Rochester	2	
RIT EV Charging D Lot South Station	Clark Drive	Rochester	2	
Dorschel Vw 408149	3817 W Henrietta Rd	Rochester	2	
Al Sigl Winton	3399 S Winton Rd	Rochester	2	
Garber Roc Shop 01	3925 W Henrietta Rd	Rochester	1	
RIT EV Charging D Lot Center	Clark Drive	Rochester	2	
RIT EV Charging D Lot North	Clark Drive	Rochester	2	
RIT EV Charging Admin Lot	Clark Drive	Rochester	2	
Rustic Village Club House	100 W Squire Dr	Rochester	2	
Bob Johnson Mazda	3755 W Henrietta Rd.	Rochester	4	
MB Rochester NY Station 1	4296 W Henrietta Rd	Rochester	2	
Winton Place Business Centre	3495 Winton Pl Bldg C	Rochester	4	
Roc Smart Phone Lot	Airport Rd	Rochester	2	
RTS Roch Tech PK2	Rochester Tech Park Building 1 777 Elmgrove	Rochester	2	
RTS Roch Tech PK1	Rochester Tech Park Building 1 777 Elmgrove	Rochester	2	
Town Of Chili	3237 Chili Ave	Rochester	2	
Vision Nissan Greece	4000 W Ridge Rd	Rochester	3	
Rochester Regional Health Unity POB 2	1561 Long Pond Rd	Rochester	2	
Rochester Regional Health Unity POB 3	1561 Long Pond Rd	Rochester	2	
Rochester Regional Health Unity POB 1	1561 Long Pond Rd	Rochester	2	
Buckman Plaza	2590 W Ridge Rd	Rochester	6	
U Of R Goergen Center	730 Library Rd	Rochester	2	
Bob Johnson Chevrolet	1271 W Ridge Rd	Rochester	1	1
Fairfield Inn By Marriott Rochester Airport - Tesla	1200 Brooks Ave	Rochester	4	
Fairfield Inn & Suites By Marriott Rochester West - Tesla	400 Paddy Creek Cir	Rochester	3	
Fairfield Inn By Marriott Rochester South - Tesla	4695 W Henrietta Rd	Rochester	3	
Country Inn & Suites By Radisson, Rochester Airport - Tesla	797 E Henrietta Rd	Rochester	3	
Holiday Inn Hotel & Suites Rochester - Marketplace - Tesla	800 Jefferson Rd	Rochester	3	
Best Western Rochester Marketplace Inn - Tesla	940 Jefferson Rd	Rochester	3	
Home2 Suites by Hilton Rochester Henrietta, NY - Tesla	999 Jefferson Rd	Rochester	3	
Dartmouth House - Tesla	215 Dartmouth St	Rochester	1	T
Country Inn & Suites By Carlson, Rochester-Pittsford - Tesla	2835 Monroe Ave	Rochester	3	T
Ellwanger Estate Bed & Breakfast - Tesla	625 Mt Hope Ave	Rochester	1	T
Spot Cowork Rochester - Tesla	21 Goodway Dr	Rochester	4	T
Rochester Institute Of Technology - Tesla	120 Lomb Memorial Dr	Rochester	1	T
EV Charge Solutions - Headquarters	7464 W Henrietta Rd	Rush	4	

Appendix E

Station Name	Street Address	City	EV Level 2	EV DC Fast
Wheatland-Chili High Sch #1	940 N Rd	Scottsville	1	
Wheatland-Chili High Sch 2	940 N Rd	Scottsville	1	
Wheatland-Chili Elementry1	13 Beckwith Ave	Scottsville	2	
Nyse Thruway - Exit 43 - Manchester	1190 State Rte 21	Shortsville	2	
Village Of Sodus	14-16 Mill St	Sodus	2	
Village Of Sodus Point	8482 Greig St	Sodus Point	2	
Village Of Spencerport - Town Hall	27 West Ave	Spencerport	2	
Village Of Spencerport - Port Museum	16 East Ave	Spencerport	1	
Napa Auto Parts	4659 W Ridge Rd.	Spencerport	4	
Station 1 @ Village Victor	70 E Main St	Victor	2	
Best Western Plus Victor Inn & Suites	7449 NY-96	Victor	4	
Eastview Mall - Tesla Supercharger	7979 Pittsford Victor Rd	Victor		8
Wyoming County Station 1	23 W Buffalo St	Warsaw	2	
Waterloo Premium Outlets	655 New York 318	Waterloo		4
Del Lago 2nd floor	1133 Route 414 Parking Garage	Waterloo	2	
Del Lago 1st floor	1133 NY-414	Waterloo	2	
Del Lago 1st floor	1133 Route 414 Parking Garage	Waterloo	2	
del Lago Resort and Casino	1133 Route 414	Waterloo		8
Vision Nissan	785 Ridge Rd	Webster	1	
Henderson Ford	810 E Ridge Rd	Webster	2	
Village Of Webster	28 W Main St	Webster	2	
Village Of Webster - Parks And Recreation	1350 Chiyoda Dr	Webster	2	
RTS Baaytown 2	Baytowne Plaza 1900 Empire Blvd	Webster	2	
RTS Baaytown 1	Baytowne Plaza 1900 Empire Blvd	Webster	2	
U Of R Bailey Rd 1	211 Bailey Rd	West Henrietta	2	
Cooper Vision	180 Thruway Park Dr	West Henrietta	2	

To find the cloest charging station to you utilize the Alternative Fuel Data Center database:
https://afdc.energy.gov/fuels/electricity_locations.html#/find/nearest?fuel=ELEC
This site is updated frequesntly and will provide the most up to date infromation on charging station locations

Appendix F: Electric Vehicle and Charging Station Data

Registered Electric Vehicles per County (2011-January 2021)

County	Genesee	Livingston	Monroe	Ontario	Orleans	Seneca	Wayne	Wyoming	Yates	Total
Year										
2011	-	-	2	-	-	-	-	-	-	2
2012	-	1	32	5	1	2	4	-	-	45
2013	10	8	200	31	1	4	18	10	8	290
2014	17	14	444	56	5	5	32	10	11	594
2015	23	23	787	90	16	17	60	14	16	1,046
2016	25	23	846	91	18	18	63	13	18	1,115
2017	39	41	1,312	144	30	21	99	21	28	1,735
2018	55	71	1,992	238	45	32	156	26	33	2,648
2019	89	100	2,677	341	58	44	204	29	37	3,579
2020	100	119	3,181	422	68	59	233	37	50	4,269
2021	120	155	3,774	523	89	62	274	44	72	5,113
January 2022	186	191	4,755	700	96	72	341	61	91	6,493

Total Number of Electric Vehicles and Charging Ports per County

County	Light-Duty Vehicles	BEV	PHEV	Total Registered EV	Level 2 Ports	DCFC Ports
Total	781,348	2,900	3,593	6,493	539	27
Genesee	37,227	58	128	186	21	2
Livingston	39,437	65	126	191	28	
Monroe	481,538	2,200	2,555	4,755	363	3
Ontario	75,930	325	375	700	43	10
Orleans	24,167	32	64	96	18	
Seneca	18,828	23	49	72	6	12
Wayne	65,633	145	196	341	39	
Wyoming	24,128	19	42	61	10	
Yates	14,460	33	58	91	11	

As of January 2022